The American School and University

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

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Foreword

by the United States Commissioner of Education

IT is a long way from the elementary and secondary school curriculums of fifty years ago to those of today. In the 80's the elementary school curriculum consisted chiefly of the three R's and of geography, United States history, and English grammar. Very little attention was given to music, art, handwork, and physical education. Study and recitations constituted the daily program. The present-day curriculum which provides for various activities was unknown. The secondary school program was usually confined to a curriculum composed of mathematics, ancient language, rhetoric, general history, and natural philosophy, with chief emphasis upon the languages and mathematics. Today the secondary school program bears little resemblance to the program of fifty years ago, since provision is now made to give secondary school opportunities to practically all the children of a community rather than to the select few preparing for college. For the narrow types of curriculum of a few years ago, school buildings consisted of nothing but recitation rooms. The educational program did not require gymnasiums, auditoriums, shops, laboratories, music and art rooms, and libraries. With the broadening of the elementary and the secondary school curriculums, new types of school buildings became necessary. The buildings had to be planned so that the new curriculums could function. Since school buildings should be used for community activities and adult education as well as for regular school work, the buildings should be planned so that the widest possible use can be made of them.

THE old type of building which provided only classrooms was easily planned, but the new type which provides facilities for the present-day educational program requires careful planning such as is described in several articles in this volume of THE AMERICAN SCHOOL AND UNIVERSITY. Careful planning is needed, not only for the present but for the future, since school buildings that are being erected now will be in use for many years. If they do not admit of alterations at little expense, they may hamper the educational program ten years hence, just as many of the school buildings now in use prevent the expansion of educational activities and services.

SINCE school buildings are a means of providing educational opportunities, they should be planned cooperatively by school-building architects, superintendents, supervisors, principals, and teachers. In addition to the approval of plans by the local school board, it is always helpful if they are reviewed by the state department of public instruction through a well-organized school-building division.

NOT many years ago play as a factor in education was almost entirely ignored. The school grounds were small and not suitable for group games or for athletic contests. Play being a vital factor in education, school plants should consist not only of schoolhouses but also of large playgrounds and athletic fields which must be carefully planned, as is shown in the article on "Outdoor Areas and Facilities for Physical Education" published in this issue of THE AMERICAN SCHOOL AND UNIVERSITY.

ONE of the big problems which need solution and to which attention is called in the article on the "Local Unit of School Administration" is the reorganization of the small units into larger ones. If reorganization is not effected in most of the states, there will still remain thousands of school districts that cannot from an administrative and financial standpoint provide adequate school facilities. School buildings will continue to be small and entirely unadapted to community activities and to the type of curriculum that should be provided. In the small school districts many services found in the large districts are lacking and cannot well be provided until the units of administration and support are enlarged.

I FEEL certain that the articles in this volume will prove of great practical value to public school and college officials.

J. W. Studebaker

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SECTION I
THE SCHOOL ADMINISTRATIVE UNIT

THE RELATIONSHIP BETWEEN STATE AND LOCAL ADMINISTRATION OF SCHOOLS

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THE control of education in the United States is vested in each of the forty-eight states. The representatives of the people, meeting in the state legislature, are made responsible by the constitution of each of the states for the establishment of a system of public schools. In all the states provision is made for the establishment of a state office of education responsible for carrying into effect the provisions of the constitution and of the statutes enacted by the legislature.

Our schools have been developed locally. In all parts of the United States the people continue to accept responsibility for their local school systems. It is only recently that two states—Delaware and North Carolina—have taken over in very large degree the responsibility for the support of schools within their borders. Almost every variation of control, and lack of it, by the state can still be found. One of the major issues before those who are interested in the development of public education and in the preservation of democracy is to be found in the degree of control and of administrative responsibility that should be exercised by the state and by the locality.

Full Responsibility by the State

There are three possible points of view with respect to the degree of centralization which should exist in the administration of public education in the several states. There are those who feel that a high degree of efficiency can be secured by making the state fully responsible for the financing of schools and for their administration. Those who advocate this solution of the problem would enact laws and promulgate rules and regulations that would result in the development of a uniformly efficient school system throughout the state. They would rest their case on the ideal of equalizing educational opportunity. They would propose that curricula, courses of study, and methods of teaching can better be determined by a group brought together in the state capital than through local initiative. They would most certainly insist that economy could be brought to pass through the state's control of the construction of buildings. They would hold that the type of local organization, the qualifications of teachers and the determination of their salaries, all are proper matters to be determined by a central authority.

Local Autonomy

A second point of view places emphasis on local autonomy. Those who take the extreme point of view with respect to the desirability of local control and administration argue against any interference by the central authority except for those broad provisions which would require that schools be organized and kept open for children for at least a minimum term during the year. They would present a strong argument in favor of local responsibility as a most important means of maintaining a feeling of responsibility upon the part of all citizens for the maintenance of this most important function of government. They would declare that any interference by the state would result in a loss of interest which would, in the long run, be fatal to democracy. They find in the support and control of education locally the one function of government in which people are most certainly interested.

Division of Administrative Functions

Neither of these extreme points of view is acceptable. What we need to do is to distinguish among the functions of administration those which can be handled to best advantage by the state and those which it is important to leave to the local community. It is correct to assume that local variations and local experimentation have helped to develop the best that

we have in our American public school system. It is also equally true that we can find in weak and inefficient local administration the very worst cases of maladministration. What we need to do is to accept the oversight and control of the state where it will not interfere with the right and the obligation of competent professional workers to serve local communities to best advantage, and in so doing to serve the state as well.

Financial Aid from the State

It seems perfectly clear that the state has an obligation in the financing of the schools. If any reasonably adequate program of education is to be made available for all the children of the state, then it is essential that the state guarantee the support of this program without overburdening any locality. In all the states the local administrative areas vary greatly in their ability to support education. The best of our systems of state support make it possible for each locality to offer the fundamental program of education mandated by the state, with an approximation of effort that is equalized among the several local units. Concretely, this means that those administrative areas least able to raise the revenue necessary for the support of education receive a maximum of help from the state; those areas most able receive a smaller part of their support from state funds. It is of the utmost importance, however, that when the state enters the situation to equalize the burden of support, freedom be left to the localities to exceed the state's fundamental program. No community should be required to exhaust its resources before receiving state aid. The correct relationship between state and locality is one in which every locality is given opportunity to exceed the state's minimum program.

Certification of Teachers

There is common recognition throughout the United States today that the certification of teachers is a state function. Here again the state enters to protect the localities against inefficient boards of control or administrative officers. But it is important that there be no limitation placed upon the local body when it desires to secure persons of higher qualifications than those required for the state as a whole. The improvement that has been made in the qualifications of teachers during the past generation has come largely from those communities that moved out ahead of any state requirement. The qualifications which these local communities demanded twenty or thirty years ago have in some cases come to be acknowledged as the desirable qualifications for all teachers. Here is a clear indication of the desirability of setting a limit to the state's control. All state requirements should be expressed as minima.

State Control of School Building

There have been tens of millions of dollars wasted in the United States on school buildings constructed under local auspices and with no control exercised by the state. It is highly desirable that plans and specifications for school buildings be reviewed by competent persons in the state office before contracts are let. Here again the state should enter to see to it that an adequate standard of schoolhousing be maintained. It would be unfortunate for this control to be extended so as to deny to the local community the construction of school buildings that would exceed the requirements set up by the state.

Accounting and Budgetary Procedures

There is need for the establishment of standards for accounting and for budgetary procedure by the state. In many localities the financial transactions of the schools are inadequately handled. The state, by offering a complete system of accounting and by requiring certain budgetary procedures, can contribute to the efficiency of the local school system without in any way interfering with the development of the local education program.

Local Control of Conduct of Schools and Teaching

In the proposals made above for state control and administration, we have been dealing with the externals of the school system. Financial support, certification of teachers, review of plans for buildings, budgetary control and accounting—all these lie outside the actual conduct of schools and the teaching of children. By contrast with these, there are those other phases of school administration which should be left to the locality. Curricula, courses of study, methods of teaching, organization of schools and classes, auxiliary services—all these are matters which the local professional staff must develop in the light of local conditions, if the schools are to serve society adequately. Let it be said in passing that the control of these internal affairs by the local group is predicated on the assumption that the local unit of administration is large enough to provide a complete school system and to employ competent administrative and supervisory officers.

Any attempt to determine courses of study or curricula on a state-wide basis is doomed to failure. The experiences of children vary greatly from community to community, and it is upon the basis of their experiences that curricula must be prepared. The vocational outlook of boys and girls who attend our schools will in some measure be determined by the locality

in which they live; hence, the subject matter of instruction will be modified in the light of their environment. Methods of teaching depend upon the type of building, equipment, and total local physical and social environment, and not upon a body of subject matter that can be predetermined and handed out from a central office. It may even be contended that each individual teacher, out of her own interests, enthusiasms and understanding of children, will vary her method to suit the group or the individual child who appears before her. Certainly, methods of adjusting school opportunities to individual children cannot be written in a pamphlet and handed to teachers. The type of community, the degree of the density of population, will determine in some measure the size of the individual school buildings, the organization of classes, the development of the program, the type of extra-curricular activities, and the like. It seems self-evident that in the internal affairs of our schools competent local leadership must be depended upon to develop schools that meet local needs.

State Supervisory Service

In making the distinction between the external affairs which the state may control up to a certain acknowledged desirable minimum, and those matters which must necessarily be handled by the local professional group, one should not fail to recognize the desirability of adequate supervisory service from the state office. In each state the staff assembled in the state office should be composed of those most competent in their several fields. In any locality the superintendent, a member of the board of education, the principal of a building, or a teacher in a classroom, should know that he can go to the state office and receive help. Scientific inquiries should be undertaken by members of the state office staff, and their results made available to local administrators and teachers. The best that is done in any locality should be evaluated and the story of that achievement made available to other localities. But this supervisory service should not be imposed upon local boards of education or local professional workers.

Effective Division of Authority

Most of the problems which now confront us with respect to the relationship between state and local administration will disappear when we are able to provide a high degree of competence in the state office, and local units of administration large enough to make possible professional leadership. The right and the obligation of the state can be met through the control of externals, provided always that in the exercise of control over their internal affairs local school systems are large enough to insure a complete school system and that variation in educational opportunity necessary to meet the needs of the total population. When such local units are organized, it is fair to assume that highly competent superintendents of schools, supervisors, directors of research, and curriculum specialists will form the staff of each local school system. With the division of authority indicated above, we may confidently look forward to leadership by the state and to experimentation in the locality which will result in a constantly improving program of public education.

THE LOCAL UNIT OF SCHOOL ADMINISTRATION

BY HOWARD A. DAWSON

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PUBLIC education on the elementary and secondary levels in the United States is administered directly through local governmental units created for a specific purpose and usually known as school districts. The functions, services, and characteristics of these local units probably have more to do with determining the kind of educational opportunities available to a majority of children in the United States than any other single factor. How these local units came about, the relationship of the characteristics of local units to major problems in educational administration, the types of local school administrative units, the characteristics of satisfactory administrative units, and procedures for organizing satisfactory units, are matters of consideration in this article.

The Origin of Local Units of School Administration

According to state constitutions, the support, control, and administration of public schools are functions of the state. The courts have repeatedly declared that the powers of state legislatures over public schools are plenary within constitutional limits. From the very beginning, however, the state legislatures have delegated powers of control to local units of government and have shifted a large part, and sometimes all the burden, of financial support of schools to these local units.

The very nature of the settlement and expansion of our nation determined the local character of our school system. The schools grew out of local communities. In the early days, with poor means of transportation and communication, communities were isolated, and, as compared with today, relatively independent. It was natural that the schools should be thought of as local concerns and the responsibilities of local communities. When colonial legislatures required the local towns (townships) to levy taxes for schools, it was often difficult for the children of some settlements to get to the school. Thus a demand arose for each community to have the privilege of keeping its own tax money and maintaining its own school near the homes of the children. This demand gave rise to the local district system under which a district was created for each school. As new territory to the west was settled, this pattern of local school organization was followed.

Administrative Units as Related to Other Problems

By and large, it is true that no single factor in our educational system of today is so great an obstacle to adequate educational opportunity for rural children as the present school district system found in the majority of the states. Much of the effort to improve rural schools results in sheer futility because of the inadequacy of local school districts.

The characteristics and qualities of the local unit of school administration form a determining factor in the solution of many of the major educational problems of the day. States are concerned with equalizing educational opportunity, but there can be no equality of opportunity under a system of small local districts; for, mere equality of financial resources under the present local system will not result in equality of educational advantages. States are concerned with the planning, construction and financing of school buildings, and the PWA of the Federal Government has been pouring millions into new schoolhouses, but nobody knows or can know where schoolhouses are needed, how many are needed or what kinds are needed, until the all-important matter of the local unit of school administration has been settled scientifically. Educators clamor for broad curriculums, and new activities and opportunities for high school pupils, but the present local district is the eternal stumbling-block. States enact complicated methods of apportioning state school funds to local units in an attempt to equalize burdens, while the organization of school districts of adequate size would immediately dispose of that problem. Leaders, everywhere, strive to get and keep better teachers for rural schools, but the teacher who accepts the professional and social limitations necessarily imposed by the small school is the exception and made up of a large element of the missionary and the martyr. Teachers desire economic and professional security through tenure laws, but no such security comes to the teacher employed by the small school district.

Types of Local Units of School Administration

Although the types of school districts set up in the several states can be classified under 17 heads, and the state laws name as many as 60 different school districts, there are in reality four broad types:

(1) The common school district, usually established without reference to the boundaries of any other unit of local government.

(2) The city school district, usually coterminous with the boundaries of a municipality.

(3) The town or township school district, coterminous with the boundaries of the civil town or township.

(4) The county school district, coterminous with the boundaries of the civil county.

The Common School District

The common school district is the prevailing type of rural school organization in 26 states. This system is based upon the fallacious theory that there should be a school district with a board of education and powers of local taxation for each school, regardless of the number of pupils accommodated or the number of teachers needed. Even when the independent school districts, listed under the second type above, are included in the statistics of these common districts, the average area is only 18 square miles, and the average number of teachers is only 5. In all, there are over 115,000 small districts usually having only one teacher each. For these districts there are over 375,000 school board members, there being many more board members than teachers.

The City School Districts

City school districts are usually, though not always, fiscally independent. The typical pattern of organization is a school board elected by the people for overlapping terms, a superintendent of schools selected by the board to execute the policies of the board and to act as the professional adviser of the board. Local taxes are levied either by the board or by direct vote of the people. A complete program of elementary and secondary schools is maintained under this unified administration. Schools are located at such points throughout the city as to suit the convenience of the pupils while at the same time keeping the schools large enough to make possible the offering of a broad program of instruction at economical units of cost.

The Township District

The town or township school district is usually fiscally independent and, as has been pointed out, is coterminous with the civil town or township. In the New England States the town is the school district, just as it is the unit of government for other local affairs. In addition to the New England States, Pennsylvania, New Jersey, and Indiana designate the township as the school district. In some other states the township is sometimes the district, as, for example, the township high school district of Illinois. These township districts on the average have only 28 square miles of territory and 27 teaching positions.

The County School District

County school districts are usually fiscally independent and coterminous with the civil county. In all, 12 states have in some degree a county unit of school organization. In actuality, only Louisiana, Maryland, Utah, and West Virginia have real county units of school administration. In these states there is one board of education in each county, elected by the people, except in Maryland, where the board is appointed by the governor. The board selects the county superintendent of schools, who performs the same duties and has the same functions as a city superintendent. Local taxes are levied on a county-wide basis either by the county board of education or by vote of the people, or by both. In Louisiana the parishes (counties) may be divided into wards for the purposes of levying additional taxes for school buildings. In West Virginia all cities are included in the county units, and there are 55 school districts, just as there are 55 counties. In Utah each county is a single school district, including cities, except in five cases, and except that one county is divided into two districts. In Louisiana only two cities, Lake Charles and Monroe, are independent of the parish district. In Maryland only the city of Baltimore constitutes a school district independent of the county.

In the other eight states having some form of county organization for schools, there are many kinds of variations and exceptions. In general, the cities are independent. They have separate boards, superintendents, and taxing powers. In fact, the exemption of cities and favored communities usually vitiates the possible advantages of the large unit of administration. The result is exemption of a large part of the wealth of a county from supporting schools for the rural children, thus creating gross inequalities of opportunity. Many of the cities exempted are not large enough to constitute efficient local units of administration. To make matters worse, some of the states select the county superintendent by popular election rather than by a board of education, as in Georgia and Florida. Alabama has election by popular vote in some counties, and by the county board of education in others.

Under a county unit of school organization, the county board of education is usually empowered to locate and maintain such schools as are necessary to accommodate the pupils. The board goes about the work of locating schools very much as a city board does. A number of elementary schools are located at strategic points, and a smaller number of high schools. Schools can be consolidated upon the decision of the

county board without popular election or petition. The title of all school property is vested in the county school district, and there are no problems of adjusting property rights when schools are abolished and other schools established. Teachers are appointed by the county board upon the recommendation of the county superintendent, and they can be transferred to other positions within the county when such transfer is thought to be to the best interest of the schools and the teachers, thus giving greater security to teachers than prevails under the common school district organization.

The chief advantages of the county school district appear to be in the greater flexibility possible because of the larger area, population, and unit of administration. In many of the states the county is the unit for administering local governmental affairs, and its adoption for the administration of schools is a logical step, because it is merely the expansion of the functions of a unit of government to which the people are already accustomed. For local taxation it gives a broader taxing area and tends to equalize burdens and benefits.

The county unit of school administration actually results in fewer and larger schools than do smaller districts. In states having the common school district, the average school has only 39 pupils and 1.85 teachers, as compared with 71 pupils and 2.13 teachers in township units, and 84 pupils and 2.39 teachers in county units. An example of the results of a larger unit of administration is found by a contrast of Louisiana under the parish (county) unit with Arkansas under the common school district. Louisiana has only 1,381 one-room schools, while Arkansas has 3,141. The average school in Louisiana has 103 pupils, while in Arkansas the number is 67.

As highways have been constructed, school consolidations have gradually and consistently taken place in county units with little or no disturbance. The common school districts are rarely responsive to changed conditions and needs.

On the average, the county school districts are by far the largest in the country. The average county district has 377 square miles of area and 93 teaching positions.

Persons not familiar with the operation of a county unit apparently consider that system as something mysterious and complicated. As a matter of fact, the system is one of simplicity. It is almost identical with the system now firmly established in cities. Its functions and administrative procedures are the same. The only differences are adjustments that have to be made to carry on a program of instruction for rural pupils. These differences between city and rural schools are often no greater nor more complicated than differences among cities, or among sections of the same city. Practically the only real difficulty about the county unit is that the people are always inclined to cling to the system to which they are accustomed. Because they have had the small district system, they are slow to try another plan. By the same token, the people accustomed to the county system would be just as reluctant to change to another. It is not a matter of the efficacy of any system; it is only a resistance to change. Where the county unit is in operation, rarely, if ever, do the stock arguments of the dire results of centralization materialize.

A Functional Basis for School District Organization

Students of school administration have come to realize that no political subdivision for local government created for other than educational purposes is likely to be entirely satisfactory as a unit of school administration. The corporate boundaries of a municipality only in rare instances coincide with the boundaries of an area from which children should attend a given school. Surveys have repeatedly shown that schools cannot efficiently be organized to fit county boundaries. School boundaries must in nearly every county cross county lines.

If existing political boundaries are not satisfactory for the administration of public education, how can satisfactory boundaries be determined? The answer is that the boundaries and size of satisfactory local units of school administration must be determined by the functions these units have to perform.

Functions of School Administrative Units

The primary purpose of school administration is to create the conditions under which satisfactory instruction is most likely to occur. It has been found throughout the American school system that the efficiency of instruction is dependent to a large degree upon the efficiency of educational leadership furnished by local administrative units. It is therefore the function of a local unit of school administration to provide the following agencies and facilities: (a) a board of control to determine policies; (b) an administrative professional leadership vested in one person to coordinate all the services of the school in the interests of the child; (c) direction and supervision of instruction, including special schools, classes, and services; (d) an efficient business management, including the operation and maintenance of the school plant and transportation; (e) direction and supervision of attendance, including relationships with social welfare and health departments and agencies.

A satisfactory administrative unit, therefore, is one that provides one or more schools which can offer in

an efficient manner at least twelve years of instruction to all pupils residing within its limits; that can furnish, at a cost which bears a reasonable relationship to the total current cost of the educational program, administrative and supervisory services necessary to facilitate the operation of the whole educational program; and that can provide, where the state does not guarantee the funds to pay the cost of the entire educational program, sufficient financial resources to support a satisfactory educational program.

Size of Satisfactory Administrative Units

The characteristics of satisfactory administrative units can therefore be described in terms of the organization and personnel required to perform the necessary functions. These services can be classified as those of (a) business and educational administration, (b) supervision of instruction, (c) health supervision, and (d) census and attendance supervision. The educational and business administration is of course performed by the school board and a superintendent of schools, the board to formulate and enact policies, and the superintendent to execute them. In addition, a program of supervision which will not require the performance of services in more than one specialized field by each supervisor will require at least 10 supervisors, or one for each 40 to 50 teaching positions, a trained librarian, a health nurse for every 2,000 children, and an attendance supervisor for every 6,000 children. These persons, together with the necessary clerical staff, make a total of 31 employees. Such an organization would accommodate approximately 10,000 to 12,000 pupils. A school system of such size would be supported by a total population of 50,000 or more.

Since it is seldom possible in rural areas to organize local administrative units of 10,000 or more pupils, it becomes necessary to consider possible modifications of the number of persons required to perform the necessary administrative and supervisory services when each employee is required to work in two or more specialized but related fields. The maximum modification is reached in an arrangement through which the functions of business and educational administration and instructional supervision will be performed by the superintendent, and the attendance and health work will be done by one supervisor. The superintendent will be assisted by a bookkeeper-clerk and the health-attendance supervisor by a clerk. Under this scheme it is assumed that the supervision of instruction will be carried on largely through the assistance of school principals and specially trained and qualified teachers in the various fields. Such an organization can provide for a maximum of 1,750 pupils, who ordinarily will be drawn from a total population of approximately 8,750 persons.

Other Criteria of Size of Administrative Units

Another approach to determining the minimum size of a satisfactory administrative unit is to find the size of the unit required to furnish acceptable administrative and supervisory services at a cost that bears a reasonable relationship to the total current cost of the educational program in the unit affected. An analysis of all the factors involved leads to the conclusion that, so far as size is concerned, a local unit of school administration should have an absolute minimum of approximately 1,600 pupils and 46 teaching positions. If, however, it is considered that such local unit should have an administrative and supervisory staff sufficient in number to provide a trained person in each specialized field of work, the absolute minimum size becomes approximately 9,800 pupils and 280 teaching positions. As to whether there are gains in efficiency or advantages in cost to be gained from units larger than these, there are no indicative data.

From these data it can be concluded that only those governmental units, such as townships, counties, and cities, that have 7,500 or more population are sufficiently large to be considered as administrative units for school purposes.*

It may be added that all investigations made to determine the proper size of public school administrative units have arrived at approximately the same conclusions as indicated in the preceding statements. Briscoe has recently completed a study through which he set up three factors as criteria for determining the minimum size of satisfactory local units for administration and supervision of schools: (1) the ability of the unit to secure skilled and continuous educational leadership; (2) the economical use of the time of the leadership employed; and (3) the economical use of the funds spent for general control. As measured in terms of either one of these criteria, the minimum size of an efficient and satisfactory local school unit of administration is one that employs at least 40 teachers.

Procedures for Organizing Satisfactory Local Administrative Units

If satisfactory local units of school administrative units are ever organized in the several states, two things are absolutely necessary: (1) the states must enact statutes that will facilitate their creation and organization; (2) area-wide and even state-wide plans for their organization must be set up.

* Based on the fact that the school enrolment is usually about one-fifth of the total population.

Statutes for the Creation of Local Administrative Units

The statutes for the organization of local administrative units may be either of two kinds: (1) by direct action the legislature can create the units, as, for example, the creation of the county as the school district by the Legislature of West Virginia in 1933; or (2) by indirect action the legislature can create units through the delegations of authority to executive bodies to create, form, or alter local units. The second of the methods is usually adopted. In that case one or more of the following plans should be followed:

(1) Arbitrary power can be delegated to the county board of education or other central body.

(2) Discretionary power can be delegated to the county board of education to abolish and consolidate school districts when authorized to do so by petition or election. Such authorization should be determined by a majority of the qualified electors *in the territory affected,* not in each district affected. In the case of an election the majority should be determined on the basis of those voting in the election.

(3) The county board of education can be required to form new districts when a proposed plan has been approved by a majority of the qualified electors in the territory affected.

(4) The county board, or other authority, can be required or authorized to form new districts when authorized *to do so by a majority in each district affected.* (This is the type of legislation now prevailing in most of the states. It is one of the most effective stumbling-blocks ever invented to maintain the *status quo* and to prevent proper educational adjustments. It is only one step better than no legislation at all.)

The statutes should also provide for an official body through which plans for district organization can be perfected, and legal status should be given to such plans.

Plan for Reorganization of Local Administrative Units

In the development of a plan for the reorganization of local school units, it is necessary to collect, arrange and tabulate data as to school census, school enrolment and attendance, the trends of school population, number of teaching positions, present school facilities, and financial resources of the present districts and counties. Maps should be prepared showing roads, topographical conditions, present school district and other political boundaries, and, most important of all, showing the location and distribution of school population by age groups. Other maps, such as soil classification and land utilization maps, are invaluable in projecting future plans for rural areas.

After collecting the primary data indicated, plans can be projected. But, before plans are made, it is essential that two things be done. (Let it be added that most school consolidations are faulty because these procedures are neglected.)

(1) It is absolutely necessary to distinguish between local attendance areas and local units of administration. *An attendance area* is the area from which children attend a single school. It rarely should have an independent system of administration. *The administrative unit* comprises all the area under a single system of local administration, and may be composed of more than one attendance area.

(2) It is necessary to decide on standards of service to be offered in the proposed school systems, and to set up standards of minimum size of units required to afford efficiently and economically the desired services. In this connection it should be pointed out that it is as fatal to good schools to organize new districts without the guidance of tested standards as it would be to construct a skyscraper without architectural and engineering standards.

Summary

Local units of school administration have grown up in a haphazard manner without benefit of social, economic, or educational planning. Upon the adequacy of these local units depends the solution of many of the major educational problems of the states. In general, these local units can be classified as the common school district, the independent city school district, the town or township school district, and the county school district. In many states the county unit district is far superior to any of the other types. In a majority of the states the adoption of this form of administrative unit would be relatively simple, the chief obstacle being the natural resistance of people to change. It is true, however, that existing political units rarely constitute entirely satisfactory local units for school administration. Standards for satisfactory local units should be determined in the light of the functions to be performed. An analysis of these functions leads to the conclusion that the minimum size of a satisfactory administrative unit is approximately 1,600 pupils and 46 teaching positions. If satisfactory units are to be organized, enabling legislation and scientific planning are necessary. In any case, the functions and organization of attendance areas and of administrative units should be distinct and separate.

AUTHOR'S NOTE.—The foregoing article is based in part on the data and recommendations contained in four publications: "School Administrative Units," by Walter S. Diffenbaugh, and Timon Covert—Pamphlet No. 34, January, 1933, Office of Education, Washington, D. C., pp. 4-5; "Satisfactory Local School Units," by Howard A. Dawson—Division of Field Studies, George Peabody College for Teachers, 1934, pp. 86-88; "The Size of the Local Unit for Administration and Supervision of Public Schools," by Alonzo Otis Briscoe—Teachers College Contributions to Education, No. 649, Teachers College, Columbia University, 1935; "A Handbook of Procedures in the Reorganization of Local School Units," by Howard A. Dawson and Henry F. Alves—Circular No. 156, January, 1936, U. S. Office of Education.

A STATE UNIT OF SCHOOL ADMINISTRATION

BY HARRY V. HOLLOWAY

Delaware State Superintendent of Public Instruction

THE state of Delaware has approximately the same population as any of the following cities: Akron, Ohio; Dallas, Texas; Memphis, Tenn.; or Providence, Rhode Island. It has one city of about 110,000 inhabitants. All the remaining towns have less than 5,000 population. It has a public school enrolment of 45,000, and a private and parochial school enrolment of about 6,000. There are three counties, each with the usual political offices. Outside of Wilmington and its suburbs, the state is predominantly agricultural. The people of the state are therefore generally inclined to be rather conservative. They take considerable pride in the fact that Delaware is the "First State" because it was the first state to ratify the Federal Constitution. But when a survey of its schools was made in 1917, and attention was called to the fact that Delaware stood in 33rd place among the states in its educational system, state pride received a considerable jolt.

The 1919 County Unit School Organization

After much agitation and opposition, a new School Code was passed by the Legislature in 1919. It provided for a county unit organization of schools. This was much in advance of the old district system. It made possible in each county a uniform tax rate for school purposes. Here, however, the natural conservatism of the people had to be reckoned with. In order to get the bill passed, the city of Wilmington and the larger towns, having what was then known as "incorporated schools," had to be left out of the general county unit plan and become "special districts." Changes were made in the Code at a special session of the Legislature in 1920, but the general administrative set-up was maintained.

Taxes had to be greatly increased in the richer districts, even though they were much decreased in some of the poorer districts. In spite of a greater state appropriation, objection continued. It became apparent that a good system of schools in an essentially agricultural state cannot be maintained by a reasonable tax on real property.

The Modified State Unit Plan

A special commission was appointed in 1921 to redraft the whole plan. That commission prepared a bill providing for the elin ination of the county unit. In its stead, it set up a modified state unit plan, thus breaking entirely new ground. The plan still preserved the more or less autonomous status of Wilmington and the thirteen "special districts."

The real contribution of the commission was the setting-up of a new scheme for financing the schools. The sources provided were as follows:

1. A graduated personal income tax
2. A corporation franchise tax
3. A corporation and capital invested tax
4. A filing fee ($3 per person)
5. Income from the permanent school fund
6. A state-wide, but county-collected, property tax (25¢ on $100)

County superintendents were eliminated, and the general administration and supervision of the schools outside of Wilmington was placed in charge of a State Superintendent and such officers as the bi-partisan State Board of Education might deem necessary. Wilmington and each special district were authorized to have, each, a superintendent of its own, chosen by the respective boards of education, but the State Department was given a supervisory function in all high schools outside Wilmington. All the schools outside of Wilmington and the special districts were put in immediate charge of the State Board of Education as a single unit.

The State Board was authorized to distribute the state appropriations among the fifteen units in accorddance with principles set forth in the Act.

Local boards of trustees (in charge of the individual districts in the State Board Unit) and local boards of education (in charge of special districts) still retained the authority to employ their teachers. Teachers outside of Wilmington, however, were, and are, required to hold certificates issued by the State Department.

The Act also provided for plans of consolidation of districts by local referendum or by the State Board, depending upon the number of children in attendance in the district. It also provided a plan for building new schools, but major building activities of the state have been carried on under special building program acts.

The entire problem, including the cost of transporting school children, provided for first in the Code of 1919, was made a responsibility of the State Board of Education.

Financial Progress

The sources of school funds at first barely supported the costs of the schools. By 1925, however, balances began to appear. By 1927 they had accumulated to such an amount that the Legislature felt justified in authorizing the beginning of a much-needed school-building program on the "pay-as-you-go" basis. Local districts were required to contribute an amount equal to 2 per cent of their 1919 assessments. Since this beginning, the state has contributed about 10½ million dollars toward the program, and in addition has paid from 90 to 93 per cent of the total current expenses of the schools. In 1929 the school fund had accumulated to such an extent that it was possible to eliminate the school tax on real property for current school expenses, and, except in a small number of the larger districts, which desire to provide school facilities in excess of the state minimum program,—which they are permitted, after a favorable referendum, to do,—there has been no such tax levied since that year. The capital invested tax and the filing fee had already been eliminated some years previous.

Advantages of the Present System

Some of the advantages of our system may be stated as follows:

1. It has raised the standard of teaching by making possible a more attractive salary for teachers. Those occupations which pay best are selected by the most competent people. Delaware now certificates no new teacher with less than a Bachelor's Degree with special preparation for teaching.

2. It has made possible for the poorest communities, if they so desire, to have as good schools for their children as the more wealthy communities. In fact, some of the poorer districts have better schools than some of the richer ones, which for one reason or another have not yet been willing to eliminate the generally inefficient one-teacher school. Out of a total of 296 one-teacher schools, 194 have consolidated with adjoining districts since 1919.

3. It has taken away from communities the premium to be found in a low tax rate for running a poor school with a poorly prepared, low-salaried teacher, inadequate equipment, poor building, etc. It now costs a district no more to have a good school than it does to have a poor one.

4. It has made better supervision of school work possible because of the employment of trained supervisors.

5. It has made it possible for all the schools to have work in art, in music, and in physical and health education, which usually, in the past, only schools in urban centers have been able to afford.

6. By making transportation a state expense, it has made transportation of children in poor communities as available and as satisfactory as in the rich communities. A splendid road-building program, whereby more than 30 per cent of the entire road mileage of the state is of hard surface, has made this condition easily possible. The state-controlled school system has been so satisfactory that two years ago the State Highway Department was put in charge of all the roads of the state outside the incorporated towns, and the through roads even in these.

It must not be thought, however, in spite of the many important advantages of our plan, that no difficulties are involved in it. It is easy to spend state money. It is therefore necessary to be constantly alert to prevent a waste of school funds. To avoid this, a state salary schedule for teachers is followed, a definite allowance for repairs of buildings and upkeep of grounds, depending upon the size of the school, is made, a definite allowance for janitor service is set up, and likewise a definite allowance for textbooks and supplies, based upon the kind of school and the number of pupils. The only need of the schools for which there is no limitation is that for fuel, light, and power. It is sometimes felt that a limit should be placed also upon expenditures for lighting.

Appropriation Provisions

The Legislature appropriates funds for running the schools at each biennial session. This appropriation is made in a lump sum after the State Board of Education has submitted a detailed budget of the estimated needs for all the 15 units. The appropriation, however, has the following unique provisions as set forth in the appropriation act of 1935:

"General Control" not more than 5 per centum, provided that the State Board of Education in making its distribution of this item may reserve not more than 2 per centum of the total budget for the functions of the State Board, its offices, officers and employees;
"Instructional Service" not less than 70 per centum;
"Operation" not more than 11 per centum;
"Maintenance" not more than 5 per centum;
"Auxiliary and Coordinate Activities" not more than 11 per centum, provided that the State Board in making the distribution of this item is authorized to reserve first, not more than 8.6 per centum of the total budget for transportation of pupils; and second, not more than 1 per centum of the total budget for the following activities: Oratorical and Declamation Association, Adult Education, a teacher in Sunnyside Preventorium, and a teacher in Brandywine Sanitorium.
"Fixed Charges" not more than 1.5 per centum;
"Capital Outlay" not more than 2 per centum;
"Debt Service" no part of the total;
"For matching the appropriation of the Federal Government for Vocational Education" not less than $20,000.

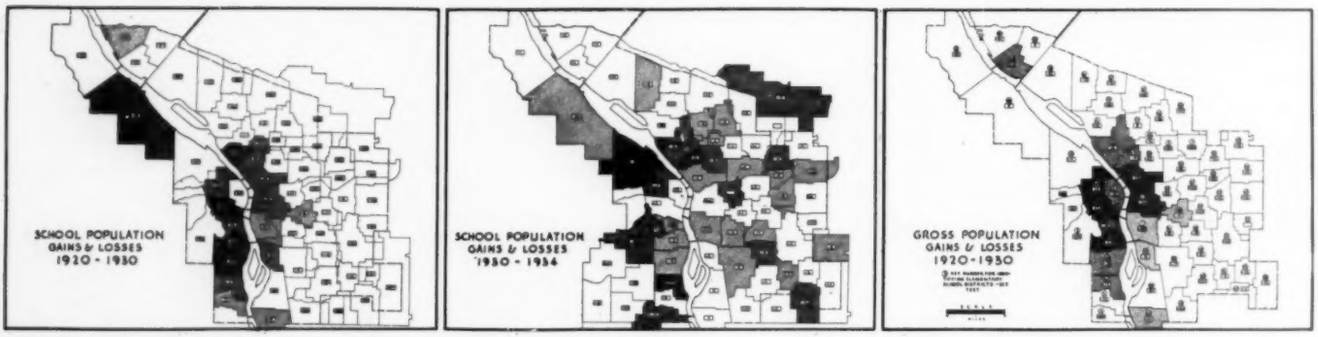
It will be seen that this method of appropriation guarantees that the most important activity of the schools, that for which they are primarily established, namely, Instructional Service, shall be protected from

encroachment by other possible demands upon the school funds.

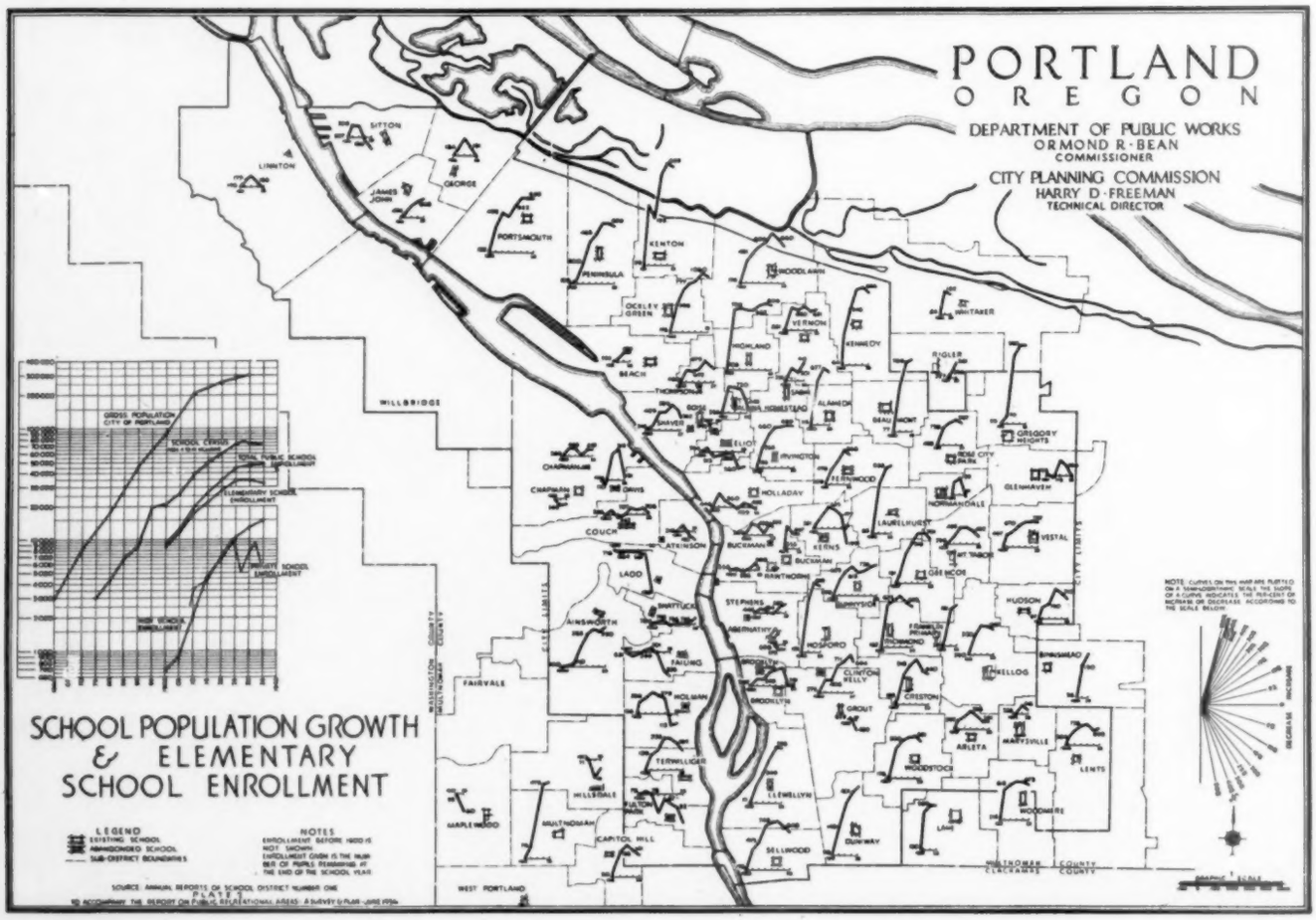
The question may be asked: Who handles the money in such a system? The answer is: Only those who receive it for services or materials. The State Treasurer is the treasurer of all the 15 school units, and pays all bills by check on vouchers approved first by local boards, then by the State Department in the case of the districts under its immediate control, then by the State Auditor.

With the taxing power of a state and a school system the size of that of a third- or fourth-class city, it can be readily understood why Delaware, conservative as it is, has been able to weather the depression better than any other state in the Union from the standpoint of its schools.

School Population Growth Graphically Presented


SCHOOL POPULATION GAINS & LOSSES 1920 - 1930
SCHOOL POPULATION GAINS & LOSSES 1930 - 1934
GROSS POPULATION GAINS & LOSSES 1920 - 1930

School-Building Problems from the Viewpoint of Long-Range Planning Are Given Consideration in a 1936 Report of the City Planning Commission of Portland, Oregon, from which these charts are reproduced



SECTION II
DESIGN AND CONSTRUCTION OF BUILDINGS

AVOIDING TROUBLESOME DEFECTS BY FORETHOUGHT IN SCHOOL-BUILDING PLANNING

BY EUGENE S. LAWLER

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SCHOOL men and school architects too often exercise the human prerogative of making mistakes. This means that there are sometimes defects in school buildings which could have been avoided by the use of proper foresight. Unfortunately, some school buildings are erected under the supervision of boards of education and architects who have had no experience in this highly technical work. Defects in such buildings cannot be said to be accidents or oversights—they are to be expected. An example of the type of error that may be expected under such conditions is found in a building erected in 1932 in which the classrooms are constructed around a gymnasium. As a result, physical education classes and all other groups in the gymnasium must be very quiet or the classrooms will be disturbed.

In 1916 the first of the Strayer-Engelhardt standards for elementary school buildings was brought out, and since that time there has been less and less excuse for serious omissions or mistakes in school-building construction as more and more material on the subject of school building has appeared. However, the plan for any school building is likely in the very nature of the case to contain some compromises, for financial resources are always limited in some degree, the number of ways in which funds can be expended to improve a school building are very great, and some desirable features are mutually exclusive. Hence, a decision has to be made as to the most essential features. For instance, it is often necessary to decide whether it is more essential that a school be located conveniently or have an adequate site. It is often necessary to incorporate some features in school plants which are not the most desirable even when the planning is the best. But, unfortunately, the planning is often not what it should be and, as a result of necessary compromises and of oversights due to lack of training and experience, many features which are included in school buildings make them less desirable for school purposes than they would be under more favorable conditions.

In an attempt to determine in a preliminary way what defects are causing the greatest dissatisfaction among the teachers and administrators who live and work in school buildings, information was asked and received on about 100 different buildings in various parts of the country. Defects in buildings which could have been avoided by proper forethought and without increasing the cost to a degree that would at all compare to the benefit received by removing the defect, were emphasized in the inquiries and interviews. As a result of the information gathered, it is possible to form a preliminary idea of the types of defects which are causing the most trouble in the school buildings on which information was received.

The Site

Approximately a third of these school buildings were reported as located on sites that are too small, which may be due to the fact that a rather large proportion of the buildings are in cities. Approximately an eighth of the replies stated that the grounds were poorly drained, and some mentioned the fact that the school was too near a main highway. One man from a state department of education says:

> "In order that the visiting public may see the new school building in all of its glory, local sentiment often dictates its location on a highway carrying fast and heavy traffic. Safety of the pupils, however, requires that school buildings should preferably be constructed on secondary highways or side streets of the village or city."

Another frequently mentioned fault was that of placing the building too near the street. The informa-

tion received emphasizes the lack of safety provisions for children crossing main highways and for loading and unloading school buses.

The Problem of Enlargement

In spite of the fact that a cardinal principle is that any school building should be constructed so that it can be enlarged without excessive expense, a large proportion of the replies state that this principle was neglected in the construction of the buildings. Another frequently mentioned defect, having to do with construction rather than educational planning, is improperly laid roofs. One administrator reports leaks in his building which have caused all the plaster to break loose, and have necessitated a replastering of the building.

Waste Space

There is still considerable complaint in regard to waste space in the internal arrangement of buildings. One particular example of waste space which persists is the open stair well, which can be eliminated by placing all the center hand-rails in one vertical plane. A large number of buildings still have heating and ventilating plants which are not separated from the rest of the building by fireproof walls and floors.

Poor Floors

Another outstanding defect is poor floors. The proper construction and treatment of floors seems to be one of the most difficult school-building problems. It is here that frequently an attempt is made to save money by using an inferior type of flooring or an unsatisfactory maintenance policy, and the result is a floor which is unserviceable and lacks esthetic appeal. Several informants reported gymnasium floors that splinter.

Acoustics

One of the most widely noted defects has to do with the acoustic qualities of buildings. Apparently a majority of auditoriums are unsatisfactory in their acoustic qualities. Perhaps it is natural that this should be the case, since it is only recently that acoustic engineering has come into its own. There is also an urgent need for a greater amount of attention to the acoustic qualities of other rooms and spaces in the building. It is of course essential that music rooms should be acoustically sound, and it is also almost essential for civilized conduct that cafeterias be acoustically treated. One can hardly expect any relaxation or quiet in a cafeteria with a metal ceiling, as reported by several. One man recommends that corridors be acoustically treated. It is to be hoped that the proper treatment of acoustic materials in the construction of school buildings may increase.

Classrooms

One of the most glaring lacks in the classrooms of many school buildings is a lack of space for the storage of reference materials, books and the materials for projects which pupils undertake. As one expert in the field has said:

"Little attention is being given to the details of classroom building. Typically, the building equipment provided consists of wardrobes, a teachers' coat room, bookcases, blackboards and display boards. There is but little recognition of the need for adequate housing of the activity program in the elementary schoolroom. This field, in my judgment, is wide open."

Storage

The matter of storage will increase in importance as both elementary and high-school classes engage more and more in activities which require the preservation of projects from day to day and week to week. It is not only classrooms that are concerned in the matter of storage space. There is the question of the storage of musical instruments for the music room, of apparatus for the gymnasium, of food and supplies for the cafeteria, scenery for the auditorium, records for the general office, general janitorial supplies for the whole building, and fuel for the heating plant. The writer does not recall having ever seen a building which was perfect in all types of storage facilities. In this, schools are similar to homes. Modern houses are now equipped with many closets designed for special uses, but the average housewife still feels that she could use more closet space.

Bulletin and Display Boards

Still another field in which there is a felt need of change, because of recent modifications in the type of teaching activity, is the space given to blackboards and bulletin boards. Studies made recently show that in most classrooms there is not as much need for blackboards as there was formerly, and a great deal more need for bulletin and display boards. This need for bulletin and display board space was mentioned so frequently that it seemed to be almost universally felt.

Height of Windows

Notwithstanding standards for school building have called for windows to come clear to the ceiling, it is quite frequently the case that this principle is not carried out. Seemingly, some school builders are not fully aware that one foot of lighting space at the top of the window is worth three or four feet at the bottom of the window when the pupils nearest the inside wall are considered. Even when the windows come clear to the ceiling, it is quite customary to use some form of shade which makes the upper six inches of the window valueless. Any type of shade or other means for

adjusting the light in a room which obstructs the highest part of the window is defective.

Library Space

Another indication of a trend in teaching which has run ahead of the adaptability of the building, and apparently even of present school-building planning, is in the use of library space. One of the most widely noted defects was insufficient reading space in the library. This is a defect occurring in both elementary and high schools, large and small. The indications are that the amount of space at present devoted to libraries will have to be largely increased. According to several informants, this frequently-used room has not been made as easy of access as would be expected.

The Auditorium

The auditorium appears to have many defects. This is perhaps to be expected, for school men are not as well acquainted by experience with the requirements for an auditorium as they are with other parts of the school building. Since it is a very expensive unit, there is often a definite tendency to pare the cost of its construction. Some of the things which are commonly done seem of doubtful wisdom. It has already been noted that there are many complaints with regard to poor acoustics. In addition, there are almost as many complaints that the depth and width of the stage are inadequate, and even more that there is inadequate provision for dressing rooms. The floor is often insufficiently inclined. There is often poor provision for aural and visual equipment, and probably the reason there are few complaints on this score is that many schools have not yet seriously taken up the matter of aural and visual education. Of course allowance must be made for the tendency to have a smaller room than the auditorium for the use of educational aural and visual equipment, and the fact that much of the use of aural and visual equipment is best in the classroom. Other defects are inadequate curtain control and lack of provision for ventilation when the auditorium is darkened.

A great deal of benefit in the way of convenience would be added to many school buildings if there were suitable ticket offices for the auditorium and gymnasium. If convenient telephone booths were established near these entrances, it would also be an aid to patrons and would add to the usefulness of the plant.

Convenience

It is very surprising that the part of the building devoted to the development of physical well-being is so often lacking in a sufficient number of drinking fountains. A defect more easily understood because of the expense involved is that the locker and shower rooms are often inadequate. The logic here seems to be somewhat similar to that ruling with regard to dressing rooms for the auditorium stage. The unit is expensive, and in an attempt to cut the expense down as much as possible, auxiliaries that are almost imperative are either skimped or omitted. It was reported that some gymnasiums have radiators that are not inset in walls and are not screened, and some gymnasiums have other types of projections from their walls.

A very large number of the cafeterias in school buildings are so located as not to prevent odors from permeating to other parts of the building. There still are cafeterias located in basements, in spite of the fact that the best advice is against such procedure.

The School Office

Sometimes American school systems are accused of over-emphasizing administration at the expense of educational activities. This is certainly not true of the apportionment of building space, if the judgment of administrators and others who furnished information is to be relied upon. There was an extremely large number of complaints that insufficient space is provided for the central office. In the words of one man:

> "Unless the office of a school building is merely a glorified coat room, it should be divided into two compartments, one of which should be the private office of the principal, the other being the secretaries' office, a waiting room for pupils, patrons and book agents. It is not only embarrassing but also very ineffective to be compelled to listen to a tirade of a school patron while a book agent sits across the table. In any school building that is large enough to have an office, that office should be so planned that the principal has a private compartment all his own."

Principals are not the only people who need privacy for conferences. As time goes on, there will be more and more demand for conference rooms where teachers can meet individual pupils and small groups. In one of the newest and finest high-school buildings, a small conference and work room is provided in connection with each classroom. A need for something like this was expressed by a number of informants.

Heating and Lighting

The widely reported defect regarding the heating system was that it is often constructed so that the gymnasium, auditorium, or administrative offices cannot be heated without heating the entire building. This error causes waste of fuel and limits the usefulness of the school plant. Administrative offices should by all means have some provision whereby they can be kept comfortable on days when the school is not in session. One can scarcely think of a more wasteful and short-sighted effort toward economy than one

which makes it impossible for the principal and his staff to work in comfort on days when the school is not in session.

As in private homes, there is a widespread demand for service plugs. Another defect which seems absurdly simple to avoid is that of placing the lights next to the inside wall on the same switch as those next to the outside wall so that it is necessary to burn all the lights on days when there is insufficient illumination for the pupils near the inside wall and the natural illumination is ample for the pupils next to the windows.

Lockers

A need which seems to be almost universal is that for more lockers. Wall space in corridors is frequently none too much to supply the requisite number of lockers, and when a building becomes crowded with pupils the supply of lockers usually proves insufficient. It would appear to be the part of wisdom to have every school building designed so that there will be as many lockers available as the greatest number of pupils it can ever accommodate, or at least that preparation be made to place a sufficient number of lockers if the demand comes.

Health Service

There are still school buildings which have toilets only in the basement. Such schools are for the most part rather old. A more widely reported defect is the lack of a sufficient number of lavatories. The writer not long since visited a school in which there were six lavatories and two drinking fountains in a building which housed approximately 1,200 pupils, and this building was only seven or eight years old and well constructed in many ways.

A need which is rather widely felt is for clinic rooms. As medical inspection and health service begin to receive the attention they deserve in more and more schools, there will be a greater and greater demand for suitable clinic rooms.

The list of defects which has been given could be increased indefinitely, because of the many details to be considered in the planning of any school building. The ones that have been mentioned seem to be in the forefront of the minds of those who gave information, and are certainly worth preventing in all new construction. These errors, as well as many others, would be avoided in much greater measure if school boards and superintendents would never make the following administrative errors:

1. Failure to make a detailed determination of the program that is to be housed in the new building. This program should include not only regular classroom subject matter but also extra-curricular activities, and, as a matter of fact, any activity that is to be carried on in the building.
2. Deciding upon the appropriation before the building needs are determined.
3. Failure to employ a clerk of the works; that is, an inspector paid by the board of education and observing the work of construction day by day.
4. Employing an architect because he says he can erect the building cheaper than any other architect.
5. Contracting with an architect at a rate of commission below that generally accepted as standard.

FUNCTIONAL DESIGN FOR SCHOOL BUILDINGS

BY WALLACE K. HARRISON

Architect, New York City

IT IS most unfortunate that many of our school buildings have been designed as monuments to Colonial and Gothic periods rather than as symbols of the growth and forward movement of mankind. The interior design of school buildings has been sacrificed in large measure in order that reverence might be paid to the architectural styles of centuries past. Such designs were entirely practical in days when the educational program was limited in scope and required only a simple plant.

To continue to plan school buildings in imitation of structures of the past is to admit the culture of a former civilization superior to ours. By disregarding the flexible forms of the present, outmoded facilities are forced on a progressive educational system. After reviewing the tremendous advances that have been made in building construction in recent years, it would seem hardly fair to deny children the advantages of these improvements.

The new school should be the landmark of the community. As a shelter, it should be marked by our modern conception of heating, ventilation, and sound-proofing. As a machine to transmit experiences and understanding to the pupil, it should be developed with the products of the present era and be adaptable to the needs of the integrated educational program. As a cultural example to the community, it should radiate modern thinking and inspire mankind to higher achievements.

Constructing the Building to Meet Present Purposes and Ideals

In planning a school plant today, the start is made with the educational program. The stubborn thought that the program must be fitted to a building of some period design may be totally discarded. The exterior treatment of the building should be entirely subordinate to the interior arrangement. Beauty of the exterior cannot be discounted. Beauty is of immense value, but it depends upon proportions and is in no way related to some recognizable and familiar decoration. School buildings should exemplify the best that can be offered in architecture. The inspiration of youth can be better developed by contact with a growing art, and a more promising mode, than by paying homage to an art long dead and discarded. In defining beauty, integrity of purpose is probably of first importance. Imitation is really only a makeshift. Greater beauty can be achieved by constructing our buildings with an eye to the educational purpose, creating simple and pleasing proportions, and discarding the imitations of the classical or antique.

It may be said that there are three primary objectives in the design of a new school building: first, maximum utility and flexibility to meet the requirements of the educational program; second, lowest cost that will assure safe and healthful conditions; and, third, beauty in keeping with the best traditions of the community.

New Materials and Methods

To assist the architect in attaining all three of these objectives, modern engineering has provided him with many new tools and new methods of construction. The perfection of mechanical devices, new materials, heat control, simple and effective means of ventilation, air-conditioning, sound-proofing, changeable partitions, and glass walls, all contribute to the integration of the building design with the educational program. Exterior walls for purposes of supporting the building load are no longer necessary. They can be made almost entirely of glass, admitting two and three times as much light as in the old buildings. The minimum standard of twenty per cent window to floor area in a classroom, a standard which is based on subjective analysis, can be exceeded as necessary, to the point where window area is as high as fifty per cent of floor area, without additional cost.

Sound-proof partitions between rooms can be so designed as to facilitate removal by one or two men, thus contributing to greater flexibility. Glass walls of rooms may open on terraces for outdoor classes in good weather. Basements and attics may be eliminated, as they should be. Every cubic foot of space can justify its existence on the basis of service to the children, resulting in a maximum of utility at a minimum of cost.

Rooms for Special Activities

The present-day educational program, which is conceived to provide children with an understanding of experiences that play a definite part in the formation of their minds and bodies, may well be translated into a basic design of a school building created around an integrated series of large workshops or units of experiences. Modern design and construction would permit large groups to work in these units with no more confusion than if divided by heavy, permanent walls. It is entirely within reason to expect that increased pupil station utilization of these units would result in

lower costs of building, in addition to more profitable integration of subject matter. Under such a plan the auditorium, instead of being of low utilization, would become a center of activity for the arts of language, speech, and drama. The stage would be the center of the unit, and the opera seats for spectators would be of least importance.

To standardize the interior or exterior design of school building to the point where it becomes almost traditional is to admit lack of initiative and imagination. The progressive effect of changes in curriculum cannot be realized to the fullest extent until the school plant has been so planned and constructed as to parallel and readily fit in with these changes. The small classroom for the teacher-pupil type of program is gradually losing ground in favor of socialization, conference sessions, and large group activities. No longer can an architect design a building on the basis of so many typical classrooms. Each room should be designed for a particular activity or emphasis to allow children the influence of environment and the use of special equipment and facilities. These improvements need not be measured in terms of additional building cost; it is merely a problem in good planning, the foundation of which is a thorough understanding of the principles and purposes of education.

The School and the Community

But the new school-plant program does not rest with these achievements. Changing concepts of the values of education are pointing the way to a new era in which emphasis will be placed on the relationship of the school to the community, and where the school plant will be used for community activities, adult education and social welfare in addition to youth training. Such a community center will require careful site as well as building planning to permit the consolidation of all these activities at a reasonable cost.

The interrelationship of school and community, the increase in high-school enrolment, the adaptation of curriculum to students who have been unable to secure a secondary education in the past, and the progress in adult education, all affect planning to a very large degree, and call for every modern engineering achievement which can better the program and bring about greater economy in construction.

RIGHT—KINDERGARTEN SCHOOL, HILVERSUM, HOLLAND
Dudok, Architect

LEFT—OPEN-AIR SCHOOL, AMSTERDAM, HOLLAND
Duiker, Architect

Photographs by Harmon H. Goldstone

ACOUSTICS IN THE SCHOOL

BY HENRY G. PERRING

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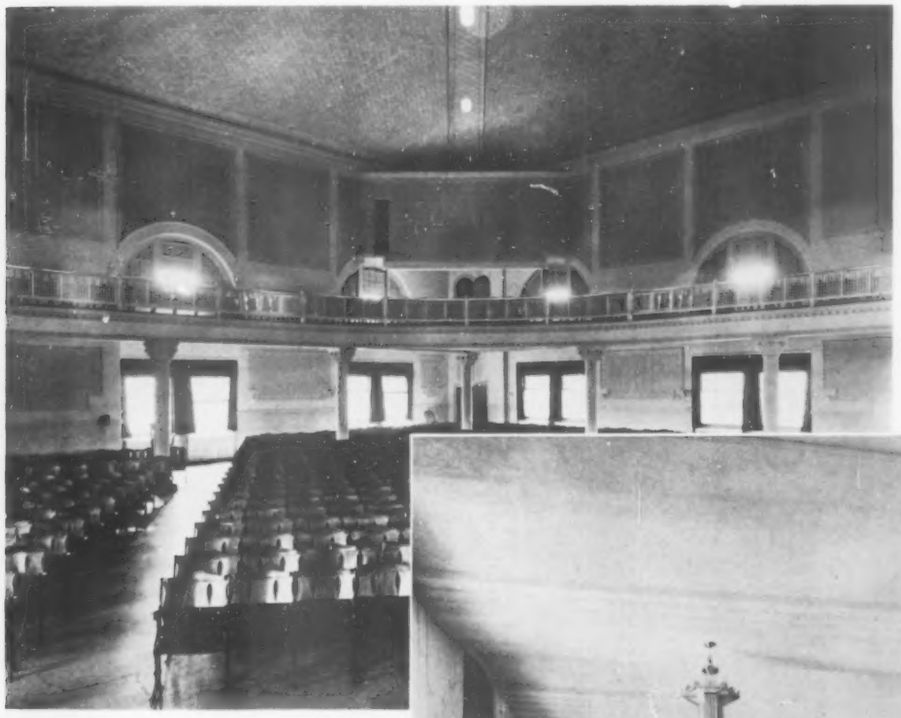
THE first scientific investigation of acoustics was begun by Dr. W. C. Sabine of Harvard University. As a result of his research, followed by that of others, relatively simple methods have been found of making possible, within structures, the best use of our ears. Commercial developments have shown how to utilize these methods at relatively small cost, and usually with betterment of architectural effect. In line with the general trend toward improving conditions which affect the efficiency and welfare of the children entrusted to the school system, it would seem to be the duty of those responsible for the erection of school buildings to provide acoustical treatment which will make for sound-comfort.

Harmful Effects of Noise

Enough data have been gathered to indicate that noise affects both the highly complicated nerve structure in the ear, and the entire nervous system.

The exact functioning of the human ear has not



Left—A Pipe Organ and Talking Movies Are Now Possible of Enjoyment in This Renovated Auditorium. Previously the Jumbled Sounds Caused Only Annoyance. The Acoustical Treatment, Including a Domed Suspended Ceiling, Cost $3,500

Right—A Fine Example of Plastic Acoustical Material Used on Flat Ceiling Areas and Offset Beams to Produce Excellent Architectural and Acoustical Effects

been completely determined, but it is known that hearing and feeling have much in common and that certain intensities of sound cease to be audible and are experienced as feeling or pressure. The effects on the ear of noise of high intensity are a feeling of discomfort, a ringing in the ears, and an ultimate impairment of hearing.

As a matter of theory, it is believed that noise has a definite effect on the nervous system which may cause nervous breakdown or at least weakening of emotional control, which is largely responsible for the present increase in lawlessness and crime; and that the resultant neurotic tendency may have a cumulative effect on future generations. Although it may seem far-fetched to connect lawlessness and crime with the noise and confusion that we sometimes have in our schools, noise is unquestionably an active irritant and reduces the quality and quantity of productive work.

Where the problem of noise exists in school buildings, it is due to the neglect of one factor in construction—sound-absorption. Fortunately this neglect can be remedied at comparatively little cost.

Reverberation and Its Effect on Hearing

Sound from any source within a room travels directly to a listener within the room at a speed of approximately 1,100 feet per minute. It also travels directly to the floor, walls and ceiling of the room, reaching the different parts in varying times, depending on the distance of the part from the source of the sound. Upon reaching its destination, a portion of the sound is absorbed and the remainder is reflected and re-reflected, reaching the listener and every part of the room. In the reflection, also, some of the sound is absorbed, the remainder going through the reflection cycle for a perceptible length of time, producing what is spoken of as reverberation.

Reverberation in a room brings to the ear sounds from various directions which are disagreeable and tiring to the person attempting to hear. Because the ears are placed one on each side of the head we are usually able to judge the direction or force of sound quite accurately. If, for any reason, the ability to judge direction of sound is destroyed or interfered with, there is definite strain in listening which gives an undesirable nervous reaction. Moreover, where there is a mixture of the sounds caused by internal reverberation and outside noise, a conscious strain is set up.

During the process of absorption and reflection, there is a dampening factor which ultimately overcomes the energy of the sound, and the sound ceases. The period of time necessary for the dampening to become operative is termed the reverberation period. The reverberation period which will allow comfortable hearing has been worked out by experiment and will vary with the size of the room.

Modern Construction Methods Increase Need for Acoustical Treatment

In the design of schools it has become almost standard practice to use fireproof construction with a minimum of inflammable material. There has come also an increased desire for sanitation, both factors adding to the cost of the plant, thus making acoustical treatment more difficult of attainment, but at the same time making it more important.

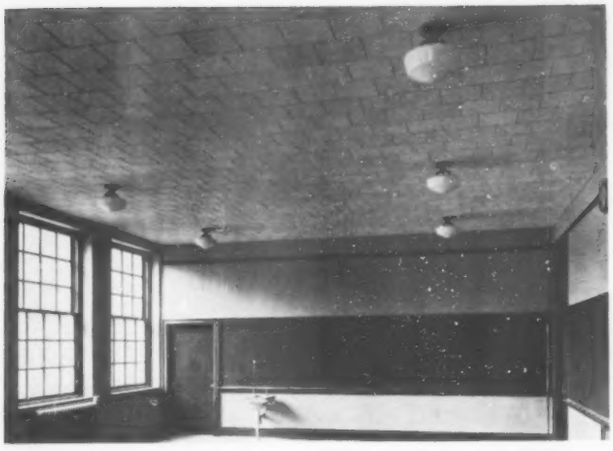
The use of cork carpet or linoleum over cement finish for floors does away with the dirt between joints of a wood floor and the unsatisfactory oiling of the wood, but provides a surface which reflects sound waves to a high degree. Hard-plastered ceilings and walls, and cement-finished ceilings and glazed brick walls, while fireproof and sanitary, form excellent sound-reflecting mediums. Where the gymnasium is utilized as the auditorium, the design normally calls for a floor of hardwood over concrete, glazed brick walls, and a reinforced concrete roof with plastered ceiling, or the concrete rubbed and left exposed. These sound-reflecting surfaces make an acoustically bad room.

In modern construction all offices, classrooms, auditoriums, natatoriums, gymnasiums and shops require some kind of acoustical treatment in order to secure sound comfort.

Acoustical Treatment Can Banish Reverberation and Noise

Noise and reverberation can be abated in any room to a point where it is sound-comfortable by the application, either during construction or after the building has been occupied, of acoustical material of sufficient sound-absorbing value to correct the unsatisfactory effects. For the greater number of cases, but two factors need be considered: the actual noise level at any time; and the extent of reverberation in the room. In fact, the actual noise level need not be ascertained in terms of decibels, its unit of measurement, but the reverberation period can be determined by a few simple computations. Having estimated how much sound should be absorbed, it is a simple matter to calculate the number of square feet of absorbing material necessary to effect this absorption. The commercial manufacturers of acoustical material have had the sound-absorbing value of their products tested by the United States Bureau of Standards. Once properly placed, sound-absorption material will quiet the room and produce large dividends of comfort.

Right—A Typical Auditorium-Gymnasium Treated for Acoustical and Architectural Effect



Left—A Typical Classroom with Ceiling Treated for Acoustical Effect. A More Pleasing Architectural Effect Can Be Securd at Little Additional Cost

Recently there has been designed in my office an elementary school in which the classrooms and corridors are finished in about the usual type of modern school standards. The School Board has not reached the point of applying acoustical treatment to its elementary schools, and the structure is typical of thousands of new schools throughout the country. Each classroom is 23 feet wide, 29½ feet long, with a ceiling height to the underside of the slab of 12 feet, 10 inches. Ceiling beams are exposed in the room and descend about 18 inches below the ceiling. The floor covering is of linoleum on concrete base, the ceiling is of rubbed concrete, and the walls are plastered.

This room is to be occupied normally by forty pupils and one teacher. When the room is empty, the sound-absorption value of the materials of which it is constructed is very low. When the room is filled, each occupant, because of hair, soft clothing, etc., has a rather high absorption value. With the room empty, the reverberation period is 6.7 seconds, while the reverberation period for comfortable hearing in a room of this size should be 1.1 seconds. With the room filled with pupils, the absorption is such that the reverberation period is reduced to about 2 seconds. It is thus seen that this room can never be comfortable for the hearing of the children occupying it, nor will the teacher in hearing recitations ever be able to hear comfortably.

Here is set up an irritating and uncomfortable condition. Had this room been treated with acoustical material on the ceiling alone, with an absorption coefficient of 0.3 the reverberation period would have been reduced in the empty room to 1.68 seconds, and in the room when fully occupied to 1.1 seconds, which would make for comfort in hearing and take strain from both teacher and pupils.

As the recommended reverberation period is arrived at experimentally and the sound absorption more or less empirically, it would not be objectionable if the acoustical treatment made the computed reverberation period fall below or rise above the recommended period by a reasonable percentage, but the classrooms thus treated would be comfortable from a standpoint of hearing in the winter when the windows were entirely closed, and would be equally comfortable in late spring and early fall when windows were open and noises came in from the outside which would ordinarily be quite objectionable. The noise level of the room in occasional times of confusion, because of acoustical treatment of the ceiling, would be reduced to a comfortable point.

In this same school building the reverberation period of the corridor, when empty, is 9.1 seconds. The recommended reverberation period for an enclosure of this size is 1.2 seconds. It may not appear particularly important to be able to hear comfortably in a corridor, but with several pupils walking or talking in the corridor the noise level is high and the sound

infiltration into classrooms is annoying. The greater the number of pupils in the corridor, the less the reverberation period, because of the sound absorption, but the greater is the possibility of high noise level. The use of sound-absorbing material with a coefficient of 0.3 on the corridor ceiling would reduce the reverberation period of the empty corridor to 1.8 seconds, which for a corridor would be satisfactory.

The smooth-surfaced ceiling of concrete is produced by using, as a concrete form, a surfaced sheet of pressed wood. The slight fins of cement at the infrequent joints between these sheets are rubbed off with carborundum when the forms are removed. The excess cost of finishing a ceiling in this way over using dressed lumber for forms may be about 3 cents per square foot. Applying a light-weight acoustical tile to the ceiling of concrete, where wood forms are used, will cost about 24 cents per square foot, so that for an acoustically correct ceiling a net excess cost of about 21 cents per square foot may be expected. The difference in cost of a sound-comfortable classroom as against the same room if sound-irritating would be about $142. The net excess cost in the corridor referred to would be $316.

Factors to be Considered in Selecting Acoustical Materials

Today there are many acoustical materials made commercially, with varying characteristics, the sound-absorption value having been scientifically determined for each. These characteristics, including sound absorption, differ widely and each must be regarded in making a selection for any particular condition.

From the acoustical standpoint, but two characteristics are necessary to be considered: first, the sound-absorbing value of the material as it is originally installed; second, the sound-absorbing value of the material when painted. Most of the materials offered cannot be painted with lead and oil paint brushed on, but can be painted with a light spray of a stain readily absorbed by the acoustical material. In many of these materials a coat of lead and oil brushed on will reduce the sound-absorption value to an almost negligible point.

Another characteristic of importance is that of the fire-resisting value of the material. Some of the materials offered will support combustion, others have no combustibility or are so treated that they will not support combustion, even though they may char to some extent.

It is possible to take advantage of the fact that many acoustical materials have a high heat-insulating value. Heat insulation can be utilized, particularly in roof construction, so that the cost of the insulation is paid for in a few years by savings in the heat system and coal pile. The sound absorption which is thus secured as an incident to insulation is of great value. This form of construction can be used to advantage in gymnasiums and auditoriums.

Some of the materials are applied in plastic form, which may be entirely acceptable in new construction but may be objectionable when applied in alteration work where messiness in application is to be avoided and the use of the room is desired at the earliest possible moment.

The weight characteristic of the various materials has wide variation and must be considered in connection with any particular installation.

Some of the materials can be used to line the concrete forms, with the result that when the forms are stripped the acoustical material is in place. This has some advantage in economy of placing, but has the disadvantage that the concrete itself cannot be inspected from below, and considerable skill is required in arranging the material so as to produce a pleasing effect in ceilings.

The light-reflecting value and color of the various materials vary to some extent and must be regarded in considering whether or not painting is required or desired after installation.

Consideration must be given to the contingency that the material may harbor vermin or germs, in which the materials offered show rather wide possibilities.

Many of the materials have been adapted to use as suspended ceilings in which all the characteristics previously mentioned must be considered before making any choice. All the materials offered are available for wall treatment in which fine architectural effects can be secured by the arrangement of wall panels. Where ceiling treatment does not afford sufficient sound absorption or where in the case of long and narrow rooms the sound absorption on the ceiling would not be sufficient to overcome the effect of quick reflection from one side of the room to another, comfort in hearing would require some treatment on the side walls. Wall treatment in a long corridor would be desirable.

Acoustical Treatment Pays Dividends

The application of acoustical treatment lowers the sound level and makes hearing easier. In one commercial establishment, a telegraph company, following a decrease in sound level from 50 decibles to 35 decibles, there was a 42 per cent reduction in errors and a 3 per cent lowering in the cost per message. In this case the application of acoustical material paid high dividends on its cost, and it is believed that the application of acoustical materials in our schools will pay equally high dividends in the education of our youth.

THE JUNIOR-COLLEGE BUILDING AND ITS EQUIPMENT

BY W. W. CARPENTER

Professor of Education, University of Missouri

ONLY within the last few years has it been emphasized that there are problems of space and equipment provision peculiar to the junior college[1]. Even a rather recent listing by junior-college executives of the problems which needed most to be studied did not include the building or its equipment among the most pressing.[2] This may be due to the fact that many of the public junior colleges in the past were housed in such parts of the already existing plant as were available or were made available by the addition of more space for the high school or elementary school. Many private junior colleges were housed in buildings that had been constructed for four-year colleges or for private secondary schools.

A rather extensive study of the literature revealed a number of buildings that had been constructed for junior-college work,[3] but only two comprehensive studies were found which indicated the type of space and equipment that should be made available, and these were limited to the public junior college.

The Chamberlain Study

The first of these two studies was made by Leo M. Chamberlain.[4] Its purpose was to investigate the housing of the public junior colleges of six Middle-Western states and to establish tentative standards relative to buildings and equipment for such institutions. The author points out that provisions for space and equipment for any school or college unit should be determined in the light of many factors, among which are: the enrolment; whether the unit will be housed separately or with other units; the administrative organization; and the program of studies to be offered. His study clearly shows that, in general, the junior-college buildings of the Middle West have not been planned in the light of these factors, with the result that the building facilities, in large measure, dictate school policies, organization and relationships.

From his study of the provisions made in the 30 colleges visited, and from an analysis of the curricula most frequently offered by junior colleges, the author has determined standards for buildings and equipment that should be very helpful to the college administrator. His study indicates that the following specialized facilities are necessary for the effective junior college:

1. Laboratory or laboratories equipped for offering instruction in general inorganic chemistry, qualitative analysis, quantitative analysis, and organic chemistry.
2. Drawing room with facilities adequate for work in beginning engineering drawing, descriptive geometry, and advanced drafting.
3. Woodworking and pattern shop.
4. Foundry.
5. Machine shop.
6. Forge room.
7. Physics laboratory equipped for offering work in mechanics, sound, heat, light, magnetism and electricity.
8. Biology laboratory equipped for giving instruction in general zoology and general botany.
9. Bookkeeping and accounting room.
10. Electrical laboratory.
11. Gymnasium and field facilities necessary to offering the physical education work generally required of college freshmen and sophomores.
12. Lecture rooms for chemistry, physics, biology, and electricity.

There would also be necessary:

"Academic rooms, administrative offices, library and study room, an assembly or auditorium, and facilities for college athletics, including a gymnasium, an athletic field and, under standard conditions, a swimming pool. An extensive program of extra-curriculum activities might make necessary the provision of additional facilities in the form of club rooms and a publications room."

The following statement is significant:

"Divisions of the building other than these, such as the stairways, corridors, toilets, locker rooms, storage rooms, cafeteria, etc., should, of course, be planned in accordance with standards already developed for high-school buildings. It is only in connection with the more highly specialized facilities that the advent of the junior college has made necessary the development of new standards in building and equipment, standards which will give recognition to

[1] Examples:
a. Davis, Jesse B.: Junior-college building discussed in "Some Problems of Administration Confronting the Public Junior College," in Proceedings of National Education Association, 1920, pp. 478-480.
b. Dean, J. S.: "The Sacramento Junior College," *Sierra Educational News* (October, 1926), Vol. 22, pp. 512-513.
c. Harbeson, J. W.: "Organization and Administration of the Public Junior College," *California Quarterly of Secondary Education* (June, 1926), Vol. 1, pp. 426-430.
d. Hill, A. P.: "Planning the Junior College," *California Schools* (January, 1931), Vol. 2, pp. 10-13.
e. Sears, Jesse B.: "Sacramento School Survey," October, 1928.
f. Wood, J. M.: "Meeting Modern Needs with Well-Planned Junior Colleges," AMERICAN SCHOOL AND UNIVERSITY, 1931-1932, pp. 49-54.

[2] a. Carpenter, W. W.: "Problems in Junior College Education," *The Junior College Journal* (October, 1934), Vol. V., pp. 13-15.
b. Eells, W. C.: "The Junior College," 1931, pp. 427-441.

[3] Examples:
a. "The Sacramento Junior College Building," *American School Board Journal* (April, 1929), Vol. 78, pp. 54-55.
b. Carpenter, W. W.: "New Building for Moberly Junior College," *Junior College Journal* (December, 1930), Vol. 1, pp. 119-124.
c. Hamilton, C. R.: "A High School and Junior College for Negroes," AMERICAN SCHOOL AND UNIVERSITY, 1931-1932, pp. 76-79.
d. Ittner, W. B., and Cantwell, J. W.: "The New Senior High School-Junior College at Wichita Falls, Texas," *American School Board Journal* (January, 1926), Vol. 72, pp. 43-44, 51.
e. "Compton Union High School and Junior College," *Western Journal of Education* (July, 1929), Vol. 35, p. 12.

[4] Chamberlain, Leo M.: "The Housing of Thirty Public Junior Colleges of the Middle West and Tentative Standards and Principles Relating to Buildings, Equipment, and Associated Administrative Problems," Bul. No. 4, Bureau of School Service, College of Education, University of Kentucky, Vol. III, June, 1931.

programs of study adapted to both the senior high-school and junior-college levels, or to a single program of studies designed for a four-year institution representing grades eleven, twelve, thirteen, and fourteen."

The author presents tentative standards classified under the following headings:

1. Library and study facilities
2. Laboratories and lecture rooms
3. Shops
4. Drawing room
5. Physical education and athletic facilities
6. Miscellaneous facilities

These tentative standards will be extremely valuable to the junior-college administrator, for they will reveal to him not only present practices in the Middle West but also in general the type of facilities that should be furnished. The limitations stated by the author should be borne in mind by the reader in the consideration of these standards.

This study reveals that an effective junior college offering a modern program adapted to the needs of youth does make real demands on housing and equipment not usually met by existing high-school facilities, and that these demands should be carefully considered in planning space and equipment for the junior college.

The Hardesty Study

The second comprehensive study of junior college building needs was made by Hardesty as a doctorial dissertation at the University of Southern California.[5] It included 32 California junior colleges. The author says:

"The junior-college program is being hampered by building limitations in the schools that want to offer more work of a terminal vocational nature than they are now prepared to offer, in the schools housed in high-school plants in which insufficient modifications have been made for accommodation of the junior-college program, and to the extent to which junior-college administrators in all junior colleges have failed to grasp and accept the proper functions of their particular schools."

This excellent study considers such general problems as "functions and curricula of the junior college in relation to the housing problem," and "class size in relation to the housing problem." A very careful study is then made of the junior-college classroom, the library, auditorium and cafeteria, lockers and office requirements. The relation of the housing of the junior college to the housing of other units is considered, as well as methods of determining the housing needs. The junior-college site is also studied. The findings of this study should be available to those charged with planning space and equipment for junior colleges. While it considers only the public situation, yet its findings and conclusions will be of real value to those planning either space or equipment for private colleges.

No comprehensive studies of the needs of private junior colleges was found in the literature. A recent article, however, entitled "Planning the Junior College,"[6] made many suggestions which should prove helpful to those planning space for either the public or the private institution.

Recent Junior-College Buildings

As the number of junior-college buildings described in the literature was small, it was thought desirable to secure for this paper a list of the junior-college buildings, both public and private, which had been constructed since 1925 or which were now under construction. A letter was sent to the State Superintendent in each state asking for such information. Certain of the superintendents furnished the information requested; certain others referred us to the individual junior colleges in their states, in which case a letter was also sent to the local director or dean. The information received from these two sources was compiled in Table No. I. This study is limited by the fact that certain school officers did not cooperate with us, but, as the number was small, it is felt that this compilation does give a good picture.

As indicated in Table I, 172 building projects have been undertaken by 97 junior colleges since 1925. These projects vary in size from a small addition to very extensive and expensive buildings. The purposes for which these buildings were constructed also show great variation. While "instruction" was of course highest in frequency, gymnasium was mentioned 39 times; dormitory, 42 times; library, 11 times; auditorium, 8 times; dining, 7 times; music and science, 6 times each; swimming, 4 times; president's home, 4 times; art, 3 times; chapel, 3 times; teachers' home, practice teaching, and power plant and heating, 2 times each; and infirmary, 2 times.

The amount of specialization and the variation in the specialization from college to college are also indicated by the following special purposes:

Art gallery	Preparatory school
Cafeteria	Psychology
Commercial	Recreation
Dressing room	Riding academy
Fine arts	Sculpture
Health center	Shops
Home economics	Showers
Kitchen	Stadium seating
Laboratories	Stage
Physical education	Speech
Practice rooms	Storerooms

Weaving

[5] Hardesty, Cecil Donald: "Problems and Practices in Housing the Junior-College Program in California," Southern California Education Monograph No. 3, 1933-1934 Series. University of Southern California Press.

[6] Carpenter, W. W.: "Planning the Junior College Building," *The Junior College Journal* (November, 1935), Vol. VI, pp. 63-68.

TABLE I

JUNIOR COLLEGE BUILDING PROJECTS

College	Location	Public or Private	No. of Project	Name of Building	Purpose	Date of Change	Grades Accommodated
Arizona							
Phoenix Junior College	Phoenix	Public	1.	Phoenix Junior College	Instruction & Gym.	1929	13-14
			2.	Stadium	Instruction Offices, & Seating	1929	9-14
California							
Brawley Junior College	Brawley	Public	3.	Junior College Building	Instruction	1926	11-14
			4.	Addition to Junior College Building	Instruction	1930-31	11-14
Chaffey Junior College	Ontario	Public	5.	Junior College Building	Instruction, Offices, Auditorium	1930-31	13-14
			6.	Aviation	Shops & Lab.	1934	13-14
			7.	Chaffey Memorial Library	Library	1935	11-14
			8.	Women's Gymnasium	Gym., Health Center, Instruction, Offices	1935	9-14
			9.	Plunge	Swimming	In progress	9-14
			10.	Men's Gym.	Phy. Ed., Instrumental Music	In progress	9-14
			11.	Bleachers	Seating	In progress	9-14
Citrus Junior College	Azusa	Public	12.	Addition to Gymnasium	Gym. & Offices	1932	9-14
			13.	Hayden Hall	Auditorium & Instruction	1934	9-14
Coalinga Extension Center, Fresno State College	Coalinga	Public	14.	Coalinga Junior College Building	Instruction	1933	13-14
Fullerton Junior College	Fullerton	Public	15.	Commerce Building	Instruction	1936	13-14
Kern County Junior College	Bakersfield	Public	16.	First wing, Junior College Building	Instruction	1929	9-14
			17.	Second wing, Junior College Building	Instruction	1931	9-14
Marin Junior College	Kentfield	Public	18.	Not Given	Instruction, Gym. & Science	Not Given	13-14
Reedley Junior College	Reedley	Public	19.	Junior College Classroom Building	Instruction	1936	13-14
San Benito County Junior College	Hollister	Public	20.	Main Building	Instruction	1930-32	9-14
			21.	Boys' Dressing Room	Dressing Room, & Showers	1935	9-14
Santa Maria Junior College	Santa Maria	Public	22.	Junior College Building	Instruction	1936	13-14
Santa Rosa Junior College	Santa Maria	Public	23.	Administration	Instruction & Offices	1930-31	13-14
			24.	Science Building	Science Instruction	1931	13-14
			25.	Gymnasium	Gym.	1935	13-14
			26.	Commercial	Commercial & Home Economics	1936	13-14
Salinas Junior College	Salinas	Public	27.	Salinas Junior College	Instruction	1936	13-14
			28.	Junior College Gymnasium	Gym.	1936	13-14
Taft Junior College	Taft	Public	29.	Not Given	Instruction, Office, Music	Not Given	13-14
Ventura Junior College	Ventura	Public	30.	Main Building	Instruction & Offices	1929	11-14
			31.	Shop	Instruction	1931	11-14
Visalia Junior College	Visalia	Public	32.	Auditorium	Auditorium	1932	9-14
			33.	Classroom Building	Instruction	1932-36	9-14
			34.	Science Building	Instruction	1933-36	9-14
Colorado							
Colorado Women's College	Denver	Private	35.	Foote Hall	Dormitory	Not Given	13-14
Florida							
Bethune-Cookman College	Daytona Beach	Private	36.	Science Hall & Refectory	Instruction & Dining	Not Given	9-14
Edward Waters College	Jacksonville	Private	37.	Theological	Ministerial Instruction	Not Given	13-14
Florida Normal & Industrial Inst.	St. Augustine	Private	38.	Gymnasium	Gymnasium	Not Given	11-14
			39.	Dining Hall	Dining	Not Given	11-14
Ringling Junior College	Sarasota	Private	40.	Ringling Junior College	Instruction & Offices	Not Given	13-14
Illinois							
Blackburn College	Carlinville	Private	41.	Butler Hall	Men's Dorm.	1928	13-14
			42.	Hudson Hall	Instruction, Offices, Library	1930	13-14
			43.	Gymnasium	Gym.	1932	13-14

TABLE I—(*Continued*)

College	Location	Public or Private	No. of Project	Name of Building	Purpose	Date of Change	Grades Accommodated
Concordia Teachers College	River Forest	Private	44.	Gymnasium	Gymnasium	1927	9-14
Chicago Christian High School & Junior College	Chicago	Private	45.	High School & Junior College	Instruction	1929	9-14
Ferry Hall	Lake Forest	Private	46.	North & South Buildings	Dormitories	1929	9-14
Frances Shimer Junior College	Mt. Carroll	Private	47.	Campbell Library	Library, Instruction & Art Gallery	1925	9-14
			48.	Winona Branch Sawyer House	Pres.' Residence	1926	——
			49.	Gym. & Swimming Pool	Gym. Pool & Stage	1929	9-14
LaSalle-Peru-Oglesby Junior College	LaSalle	Public	50.	High School & Junior College	Instruction	1927	9-14
			51.	Addition to High School & Junior College	Instruction	1936	9-14
Lyons Township Junior College	LaGrange	Public	52.	Lyon Township Junior College	Instruction, Gym. & Offices	1928	9-14
Monticello Seminary	Godfrey	Private	53.	Wade Hall	Music, Speech, Art Studio	1926	9-14
Morton Junior College	Cicero	Public	54.	Addition to J. Sterling Morton Building	Instruction, Gym., Cafeteria & Auditorium	1927-28	9-14
			55.	Addition to J. Sterling Morton Building	Music, Offices, Storerooms	1930	9-14
Springfield Junior College	Springfield	Private	56.	Junior College	Instruction	1930	13-14
Kansas							
Central Academy and College	McPherson	Private	57.	Central Heating Plant	Heating	1925	9-14
			58.	"Stoll" Hall	Boys' Dorm.	1926	9-14
College of Paola	Paola	Private	59.	Admin. Bldg.	Offices, Chapel, Dorm.	1926	9-14
El Dorado Junior College	El Dorado	Public	60.	Junior College—Senior High School	Instruction, Gym., Offices, Auditorium	1935-36	10-14
Highland College	Highland	Private	61.	Administration Building	Instruction & Offices	1931	13-14
Hutchinson Junior College	Hutchinson	Public	62.	Addition to Senior High School Building	Instruction & Gym.	1928	10-14
Independence Junior College	Independence	Public	63.	(Remodeled to house Junior College) Nees Hall	Instruction	1925	9-14
St. John's College	Winfield	Private	64.	Administration Building	Administration	1925	9-14
St. Joseph's College & Military Academy	Hays	Private	65.	St. Joseph's College & Military Academy	Not indicated	1931	10-14
Kentucky							
Campbellsville College	Campbellsville	Private	66.	Training School	Instruction	1934	1-8
Lees Junior College	Jackson	Private	67.	Jackson Hall	Dormitory & Library	1927	13-14
Lindsey Wilson Junior College	Columbia	Private	68.	Model Training School	Instruction for Supervised Teacher Training	1934	1-6
Nazareth Junior College	Nazareth	Private	69.	Gymnasium	Gymnasium	1928	9-14
Pikeville Junior College	Pikeville	Private	70.	Administration Building	Chapel, Offices, Instruction	1926	11-14
			71.	Wickham Hall	Boys' Dorm.	1929	11-14
Sacred Heart Junior College & Normal School	Louisville	Private	72.	Gym. & Auditorium	Gym., & Auditorium	1926	13-14
St. Catherine Junior College	St. Catherine	Private	73.	(New wing) Main Bldg.	Chapel, Offices, Science, Instruction	1931	13-14
Sue Bennett College	London	Private	74.	Gymnasium	Gymnasium	1925	13-14
			75.	Men's. Dorm.	Dormitory	1926	13-14
Villa Madonna College	Covington	Private	76.	Remodeled	Not Indicated	1935	13-14
Michigan							
Bay City Junior College	Bay City	Public	77.	Addition to Central High School & Junior College	Instruction, Library, Offices	1931	10-14

TABLE I—(*Continued*)

College	Location	Public or Private	No. of Project	Name of Building	Purpose	Date of Change	Grades Accommodated
Ferris Institute	Big Rapids	Private	78.	Alumni Building	Instruction & Gymnasium	1929	9-14
Flint Junior College	Flint	Public	79.	Remodeled	Instruction	Not Given	13-14
Muskegon Junior College	Muskegon	Public	80.	Muskegon Senior High School & Junior College	Instruction & Gymnasium	1925-26	10-14
Port Huron Junior College	Port Huron	Public	81.	Remodeled	Instruction	1928	8-14
Spring Arbor Junior College	Spring Arbor	Private	82.	Gymnasium	Gymnasium	1929	10-14
			83.	Auditorium	Auditorium	1929	10-14
Mississippi							
Copiah-Lincoln Junior College	Wesson	Public	84.	Russell Hall	Men's Dorm.	1928	9-14
			85.	Gymnasium & Dining Hall	Gymnasium, Dining & Kitchen	1928	9-14
			86.	Annex	Instruction	1928	9-14
			87.	Teachers' Home	Teachers' Home	1936	——
Harrison-Stone-Jackson Junior College	Perkinston	Public	88.	Two Dormitories	Dormitory	1927-29	9-14
			89.	Library	Library	1927-29	9-14
			90.	Administration	Admin.	1927-29	9-14
			91.	3 Dwellings	Residences	1927-29	9-14
			92.	Power House	Power House	1927-29	9-14
			93.	Gymnasium	Gymnasium	1927-29	9-14
Holmes-Carroll Junior College	Goodman	Public	94.	Gymnasium	Gymnasium	1929	11-14
			95.	Boys' Dormitory	Dormitory	1930	11-14
			96.	Home Economics	Instruction	1930	11-14
			97.	Agriculture	Instruction	1930	11-14
Newton-Neshoba-Scott-Leake-Winston Junior College	Decatur	Public	98.	Gymnasium	Gymnasium	1930	11-14
			99.	Dormitory	Dormitory	1928	11-14
			100.	Science-Commerce	Instruction	1930	11-14
Pearl River Junior College	Poplarville	Public	101.	White Hall	Girls' Dormitory	1929	11-14
Pearl River Junior College	Poplarville	Public	102.	Military Hall	Boys' Dormitory	1935-36	11-14
Southwest Mississippi Junior College	Summitt	Public	103.	Felder Gym.	Gym.	1931-36	13-14
			104.	Simmons Library	Library	1933	13-14
			105.	Barracks (Frame)	Dormitory	1933	13-14
Sunflower-Humphreys Leflore Junior College	Moorehead	Public	106.	Administration	Instruction	1926	11-14
			107.	Boys' Dormitory	Housing	1931	11-14
Tate-Quitman-Panola Junior College	Senatobia	Public	108.	Science Building	Instruction	1929	9-14
			109.	Gymnasium	Gymnasium	1929	9-14
Missouri							
Conception Junior College	Conception	Private	110.	St. Michael's Hall	Dormitory, Gymnasium, Instruction	1929	13-14
Hannibal-LaGrange College	Hannibal	Private	111.	Administration Building	Library, Gymnasium, Auditorium, Instruction, Dietary	1928	13-14
			112.	Boys' Dormitory	Dormitory	1928	13-14
			113.	Girls' Dormitory	Dormitory	1928	13-14
Jefferson City Junior College	Jefferson City	Public	114.	Junior College	Instruction, Auditorium, Offices	1926	10-14
Kemper Military School	Boonville	Private	115.	Swimming Pool	Swimming	1925	9-14
Moberly Junior College	Moberly	Public	116.	Moberly Junior College	Instruction, Gymnasium, Offices	1930	11-14
St. Paul's College	Concordia	Private	117.	Biltz Hall	Dormitory	1925	9-14
			118.	Kaeppel Memorial	Gymnasium	1925	9-14
Stephens College	Columbia	Private	119.	Wales Hall	Dormitory	1926	13-14*
			120.	North Hall	Dormitory	1931	13-14
			121.	Laura Stephen Hall	Dormitory	1935	13-14
			122.	Walter Hall	Instruction (Fine Arts)	1935	13-14
			123.	Raynor Stables	Riding Academy	1935	——
			124.	President's Home	Residence	1926	——
Montana							
Northern Montana College	Havre	Public	125.	East Hall	Instruction	Not Given	13-14
			126.	Pershing Hall	Instruction	Not Given	13-14
			127.	Residence Hall	Women's Dormitory	Not Given	13-14
Nebraska							
McCook Junior College	McCook	Public	128.	Junior College Building	Instruction, Offices	1934-35	13-14
New Hampshire							
Colby Junior College	New London	Private	129.	Dormitory	Dormitory	Not Given	11-14

* A small percentage of the enrolment is in grades 11-12.

TABLE I—(*Continued*)

College	Location	Public or Private	No. of Project	Name of Building	Purpose	Date of Change	Grades Accommodated
New Mexico							
Eastern New Mexico Junior College	Portales	Public	130.	Administration & Vocational	Instruction & Offices	Not Given	13-14
Spanish-American Normal	El Rito	Public	131.	Dormitory, Gymnasium, Vocational	Dormitory, Gymnasium, Instruction	Not Given	7-13
New York	Bronxville	Private	132.	Dudley Lawrence Hall	Dormitory & Instruction	1928	13-14
Sarah Lawrence College			133.	Titsworth Hall & Gilbert Hall	Dormitory, Instruction	1928	13-14
			134.	McCracken Hall	Dormitory, Library, Instruction	1930	13-14
			135.	Bates Hall	Art, Dining, Recreation, Heating Plant	1929	13-14
			136.	Bates Hall (First Addition)	Art, Music, Sculpture, Weaving	1929	13-14
			137.	Bates Hall (2nd Addition)	Science & Psychology	1934	13-14
			138.	Infirmary (1st Addition)	Infirmary	1930	13-14
North Carolina							
Barber-Scotia College	Concord	Private	139.	Berry Hall	Music	1926	13-14
Belmont Abbey College	Belmont	Private	140.	Alumni Gym.	Gymnasium	1930	9-14
Boiling Springs College	Boiling Springs	Private	141.	Gymnasium	Gymnasium	1929	13-14
Campbell College	Buie's Creek	Private	142.	D. Rich Memorial Administration Building	Admin.	1926	8-13
			143.	Dining Hall	Dining	1933	8-13
Ebenezer Mitchell Junior College	Misenheimer	Private	144.	Boys' Dormitory	Dormitory	1935	9-14
			145.	Dining & Heating Plant	Dining Room & Heating Plant	1935	9-14
			146.	Girls' Dormitory	Dormitory	1935	9-14
			147.	Girls' Dormitory	Dormitory	1935	9-14
			148.	Pres. Home	Residence	1935	——
Immanuel Lutheran	Greenboro	Private	149.	Women's Dormitory	Dormitory, Home Ec., Instruction	1927	8-14
			150.	Academic Building	Science & Preparatory School	1931	8-14
			151.	Administration Building (reconstructed)	Instruction & Offices	1931	8-14
Lee-McRae College	Banner Elk	Private	152.	Tennessee Hall	Dormitory	1925	13-14
			153.	Virginia Hall	Dormitory	1927	13-14
			154.	South Dormitory	Dormitory	1927	13-14
Louisburg College	Louisburg	Private	155.	Pattie Julia Wright	Dormitory	1926	13-14
			156.	Franklin County Building	Dormitory, Instruction	1928	13-14
Mars Hill College	Mars Hill	Private	157.	Library (Addition)	Library	1933	11-14
			158.	Memorial Infirmary	Infirmary	1935	11-14
Mitchell College	Statesville	Private	159.	Carlton Gymnasium	Gymnasium	1931	11-14
Montreat College	Montreat	Private	160.	Administration Building	Library, Auditorium, Instruction	1935-36	9-14
			161.	Gymnasium	Gymnasium	1933	9-14
Oak Ridge Military	Oak Ridge	Private	162.	King Gymnasium	Gymnasium	1935-36	9-14
Peace Junior College for Women	Raleigh	Private	163.	East Hall	Dormitory	1928	13-14
Pineland College	Salenburg	Private	164.	Edwards Military Institute	Dormitory & Instruction	1932	7-14
Pennsylvania							
Alliance Junior College	Cambridge Springs	Private	165.	Kosciuszko Hall	Dormitory	1931	9-14
			166.	Alliance Hall	Instruction	1934	9-14
The Ogontz School	Rydal	Private	167.	Junior College Building	Dormitory, Gymnasium	1929	9-14
Wildcliff Junior College	Swarthmore	Private	168.	Miller Crist Building	Administration, Gym., Swimming Pool	1925	8-14
Utah							
Branch Agriculture College	Cedar City	Public	169.	Shop & Gym. Buildings	Shop & Gymnasium	Not Given	11-14
Weber College	Ogden	Public	170.	Monche Building	Instruction	Not Given	13-14
Vermont							
Green Mountain Junior College	Poultney	Private	171.	Boiler House	Boiler House	1926	9-14
West Virginia							
Beckley College	Beckley	Private	172.	Administration Building	Instruction, Offices	Not Given	13-14

Although 18 projects indicated no date other than that it was 1925 or later, the distribution of the dates of completion when indicated is of interest. These are shown in Table II.

TABLE II

DATE OF COMPLETION OF JUNIOR-COLLEGE BUILDING PROJECTS

Date	Frequency	Date	Frequency	Date	Frequency
1925	10	1930	12	1934	6
1926	17	1931	16	1935	15
1927	6	1932	5	1936	15
1928	17	1933	6	In progress	3
1929	26				

The grades for which the provisions were made is also of interest to those who are planning junior college programs. When the grades which the project was intended to house were not indicated, these were obtained from the 1936 Directory of the Junior College, prepared by Dr. Doak S. Campbell, Secretary of the American Association of Junior Colleges. This information is shown in Table III.

TABLE III

GRADES FOR WHICH PROVISIONS WERE MADE

Grades	Frequency	Grades	Frequency
13-14	63	7-14	1
11-14	26	8-13	2
10-14	8	7-13	1
9-14	59	1-8	1
8-14	5	1-6	1
	Residences, etc., not for students	5	

The information included in these three tables seems to clearly indicate the complexity of the junior-college building problem. The junior college, whether public or private, is not limited in its scope or interest to the 13th and 14th grades. This study does not attempt to predict the future organization, nor is it advocating any one type.

DESIRABLE TRENDS IN SCHOOL-PLANT PLANNING

WHILE the actual amount of research completed during the past few years that would indicate trends in schoolhouse planning is rather limited, the writings of school administrators, architects, and educational specialists indicate much thought and interest in the problem. Important changes are now taking place from the old traditional school to one that will be largely devoted to the problem of assisting the boys and girls to become better acquainted with their environment. Such a changed conception necessitates marked changes in the function of the entire school plant. No longer can the school be a place where the children sit quietly for five or six hours per day. The school must become a dynamic institution assisting dynamic personalities to become more wholesomely integrated with their environment. Some of the distinct trends revealed as desirable by the current literature on school-plant planning are:

1. The curriculum needs of a community determining the school plant program
2. A larger and better equipped school plant
3. An increased participation of professional educators in the planning and the execution of the school planning program
4. A more flexible and expansible school plant
5. An increased interest in national planning which has developed rapidly during the past five years
6. An increased interest in state and regional planning
7. The development of community planning
8. The local superintendent of schools assuming the responsibility in the management of the school-plant planning program
9. The construction of a more durable school plant
10. The functional use of the school plant
11. The adaptation of the school plant to serve the social, recreational, and educational needs of the community
12. The development of a simple but dignified type of architecture
13. A more efficient utilization of the school plant
14. The use of a comprehensive school survey as the basis for determining the school plant needs
15. The wider use of the pay-as-you-go plan for financing the school-plant planning program
16. The development of a low open type of school building
17. A change in the kinds and types of equipment used
18. The expenditure of a decreasing per cent of the total school budget for capital outlay.

—Summary of a paper by Dr. Charles A. Lee, Professor of Education and Director of Educational Service, Washington University, St. Louis, Mo., and Price Chenault, Director of Adult Education Teacher Training, New York City, reprinted by permission of *Review of Educational Research*, official publication of The American Educational Research Association, a department of the National Education Association.

SCHOOL BUILDING IN THE SMALLER COMMUNITIES

BY HARVEY JAMES PEARCE
of
Bonsack & Pearce, Architects, St. Louis, Mo.

IN the designing of grade and high-school buildings in many of the smaller communities and consolidated school districts in the state of Missouri, most of the essentials of the larger and wealthier city schools are required and, in addition, community features are desired, or made necessary by conditions peculiar to the locality. Thus the problem resolves itself into obtaining the essentials, in a building of safe construction, flexible in plan and pleasing in appearance, with as many of the special features as it is possible to include within a definite limit of cost.

Complicating the successful solution of the problem in many of the districts, are low assessed valuations of property, on which the bonding capacity of the school district is based, and which determine the limit of funds available for building purposes; also large pupil enrolments, which determine, in the main, the size of the building. In the last few years, assessed valuations have been steadily declining, and pupil enrolments have been increasing. The majority of the boards of education in these school districts are anxious to provide the children of their districts with at least the same protection, opportunities and privileges afforded the children of adjacent districts.

Another item which has a considerable bearing on the ultimate design of the building and its cost is the site available for school-building purposes. Some districts own or purchase a site before they employ their architects, and this ofttimes has a compelling influence on the size, shape, height and orientation of the completed building, and the result is therefore not always the best.

More successful results may be secured if the architects are selected first, and if then a survey is made of all available sites, the present and future population trends checked, and an educational program decided upon. If this procedure is followed, the board of education can be assured that no money will be spent for extravagant or experimental purposes.

In former years school architects were required to make a survey of sites, population trends, etc., and, with the assistance of the local superintendents, outline an educational program for building purposes and assist in the preparation of a financial program to provide the necessary funds. Fortunately for all concerned, ever since Dr. N. E. Viles has been the Director of School Building Service for the Missouri State Department of Education, the approval of the site, and detailed educational and financial programs to be followed by the school districts are worked out by him and furnished to the architects before the preparation of the preliminary sketches and estimates of cost are made. Dr. Viles has written a comprehensive article on "The Functional Planning for a Twelve-Year Consolidated School," which will be very helpful to school districts having this or similar problems to solve.*

In the designing of school buildings in Missouri, the essentials are considered in the following order of their importance: first, safety and protection of the pupils' life, health, eyesight and morals; second, good, sufficient and safe housing for the educational program, special features and community requirements; and, third, the architectural embellishment of the building. All these must be secured within the limit of funds available.

Safety

Whatever type of construction is adopted, it should be first class. Each and every structural member should be designed with the proper factor of safety.

In buildings more than one story in height, the vestibules, corridors and stairways are built of fire-resistive materials, and of proper dimensions, and all exterior doors are provided with safety type panic bolts. All lockers, drinking fountains, exhibiting cases, etc., are built in the corridor walls, to avoid projections into the corridor space. Boiler and fuel rooms are entirely fireproof, with fire-door on interior side, and exit directly to the exterior of the building.

One-story buildings such as those at Bagnell Dam and Monroe City, herein illustrated, are built according to the A. I. A. classification, Type C; that is, with masonry walls and fire-resistive corridors, but with ordinary construction otherwise in roofs, partitions and finish.

Two-story buildings, such as the Ste. Genevieve School building, also illustrated, are built according to the A. I. A. classification, Type B; that is, of fire-resistive construction in walls, floors, stairways and ceilings, but with wood finish, wood or tile floor surfaces and wood roof construction; the ceiling having metal lath and plaster finish, and the roofs slate or asbestos shingles.

* See the December, 1936, issue of *The School Executive*, Lincoln, Nebr.

Sufficient natural and artificial light is provided to protect the eyesight of the pupils; and, where possible, there are clinics for health and teeth examinations. The toilet facilities are of the sanitary schoolhouse type of proper sizes for pupils of various ages, and sufficient in number; the boys' and the girls' toilet rooms being as widely separated as possible. The heating and ventilation systems are provided with control so that the desired temperatures can be maintained and the air flow regulated.

The materials in vestibules, corridors, toilet rooms, locker and shower rooms are of the sanitary type. These units of the building, and also the auditoriums, are provided with cove-base glazed-tile wainscot 6 feet high, and above this height they are finished in cement plaster. The combination auditorium-gymnasium and stages have glazed-tile wainscots 7 feet 6 inches high, with hard wall plaster above this height. The ceilings are finished with tile board, which is pleasing in appearance and economical in cost, and has a measure of insulating and acoustical correction values.

Adequate Housing for the Educational Program

The second essential is: sufficient space, properly divided and arranged, to house the educational program and community features; also facilities and conveniences for carrying-out the educational program.

The Missouri State Department of Education requires that there shall be 16 square feet and 192 cubic feet for each pupil in class and recitation rooms, which shall have 12-foot-high ceilings. This area requirement is considerably increased in the various special departments.

Each building is planned to be so flexible that the essentials may be secured within the funds available, and that as many of the special features, community needs, and necessary additional space requirements may be added from time to time, at economical cost and without detracting from the original appearance of the building.

Architectural Embellishment

Because safety and adequacy are of greater importance, architectural embellishment is placed third in order. If the building is properly planned, placed and proportioned, the exterior architectural appearance, even though plain because of insufficient funds, will have a pleasing and inviting simplicity, the beauty of which will be further enhanced by a little carefully planned landscaping.

In order to secure all the essential requirements and as many of the special and community features as possible, not only is it necessary to critically examine and analyze each item, but each unit of the building must be made to serve dual purposes if desirable.

Special and Community Features

The cooking rooms of domestic science departments are planned for use in preparing refreshments to be served in lunch rooms or auditorium.

Combined auditoriums and gymnasiums are used for school assemblies, play rooms in inclement weather, theatricals, concerts, public meetings, motion pictures, commencement exercises, etc., as auditoriums; and for physical training, basketball, volleyball, etc., when used as gymnasiums. The design and materials in this unit are such as not to clash with either use purpose.

The auditorium-gymnasiums are designed with the stage and the spectators' bleachers on opposite sides of the major axis of the basketball court, thus making the spectators' seats available in any use of the unit. This also permits of exterior window lighting in the outside wall parallel to the major axis of the court. The shower and locker rooms are usually located under the bleachers, getting the proper amount of sunlight and confining the steam from the showers to these spaces.

The stages of the auditorium-gymnasium units are located so that the boys' and the girls' general toilets and wash-rooms and the adjacent classrooms are at opposite ends of the stage, and can be used as dressing rooms, especially when large plays or pageants are being presented on the stage. Stages can be filled with bleacher seats for basketball games, and are provided with chair storage space below.

Shower and locker rooms are located and arranged so that they serve the gymnasium from the interior, and the baseball, football and track teams, etc., from the exterior side, directly from the athletic field. They are also arranged so that they can be cut off from the rest of the building during the vacation season and used in connection with a public playground, which is becoming more popular each vacation season.

Science laboratories are equipped with tables and seats so that all students face towards the front of the room, thus permitting these departments to be used also as recitation rooms.

Libraries and study halls are located on the ground floor where possible, so that they can be entered directly from the outside and not only used by the school but also serve a community purpose where there is no public library, the study hall being equipped for use as the library reading room.

Community rooms, as provided in the Ste. Genevieve High School building, are located on the ground floor, with separate entrance. Where provided with a small stage at one end, they can be used for music rooms, for orchestra and band practice, club and public meetings, small school assemblies, rehearsals of plays, for motion pictures and exhibitions.

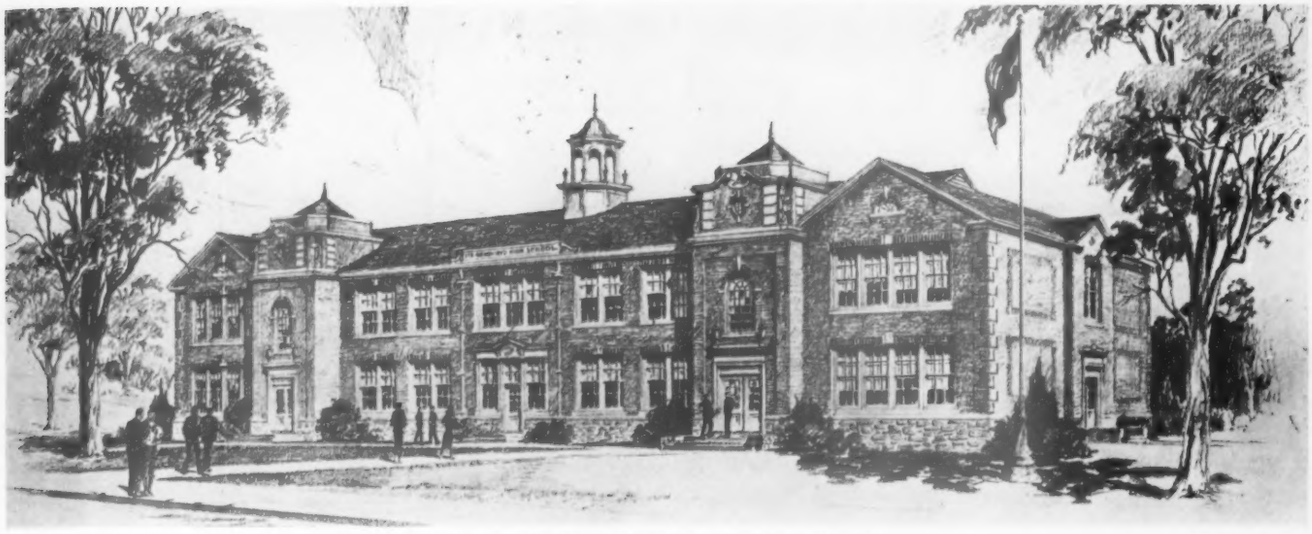
School of the Osage, Bagnell Dam, Missouri

Three Types of School Buildings

The three different types of school buildings illustrated herewith by perspective drawings are named in the order of their size and cost: the Monroe City Grade School; the Ste. Genevieve High School building; and the "School of The Osage," on the lake of the Ozarks at Bagnell Dam, Missouri.

The site conditions of the School of The Osage in a large measure determined the plan and architectural design of the building. The contour lines of the site extend in the shape of a horseshoe, and the only level space for a playground was made possible by placing the building at the rear of the site and locating the front wall of the three units of the building on a fairly level contour line. From this line the site sloped rather rapidly to the rear, and therefore a number of rooms were located entirely above the ground level, and can be entered directly from the outside.

Another site requirement was that the building must



Ste. Genevieve High School, St. Genevieve, Missouri

face in the direction of the main highway, although at quite a distance from it.

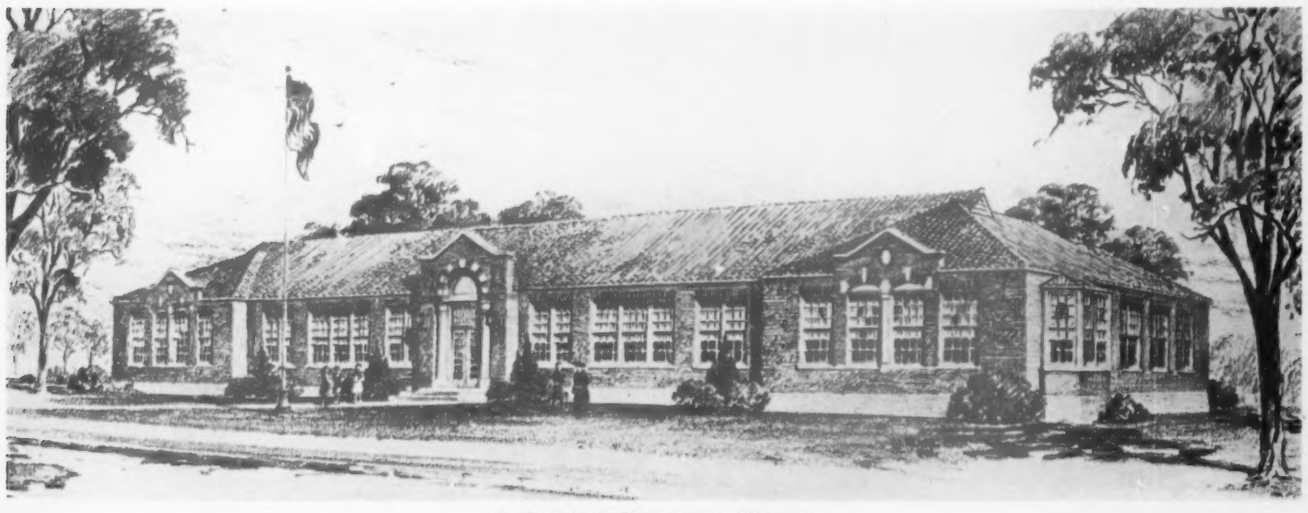
Then there was the all-important requirement of proper orientation, and as a one-story building was decided upon that could be built in separate units, the horseshoe shape of the contour lines was found to admirably solve this problem. It will be observed that the auditorium-gymnasium wing receives north and south light on the long axis, and east and west on the ends; the center or High School unit, southeast and northwest light; and the Grade School wing, east and west light.

For exterior design a rustic, rambling English type of architecture was adopted, in keeping with the rugged grandeur of the locality, with its steep sloping hills and magnificent trees. The foundation walls are concrete faced with native stone found on the site, and above this stone base the walls are of brick laid up of overburnt, warped and culled brick in a wide, rough joint. The roofs are of asbestos shingles.

The Ste. Genevieve High School building is a two-story building of Georgian design, with walls of sand mold Stratford blend brick with gray stone trim. The roofs are of Salem type asbestos shingles laid with random widths and lengths. This new school stands on a very high location above the Mississippi River.

The Monroe City Grade School building is of one-story modified Romanesque design, with stone base, rough-textured matt brick, stone trim, and green tile roof, to match the materials in the High School building on the same site.

In the case of the three school buildings illustrated, the educational program has been fully provided for, together with all other requirements, within the funds available. This ideal condition can be brought to pass only by painstaking effort, a thorough understanding of the problem, and the cooperation of all concerned.



Grade School, Monroe City, Missouri

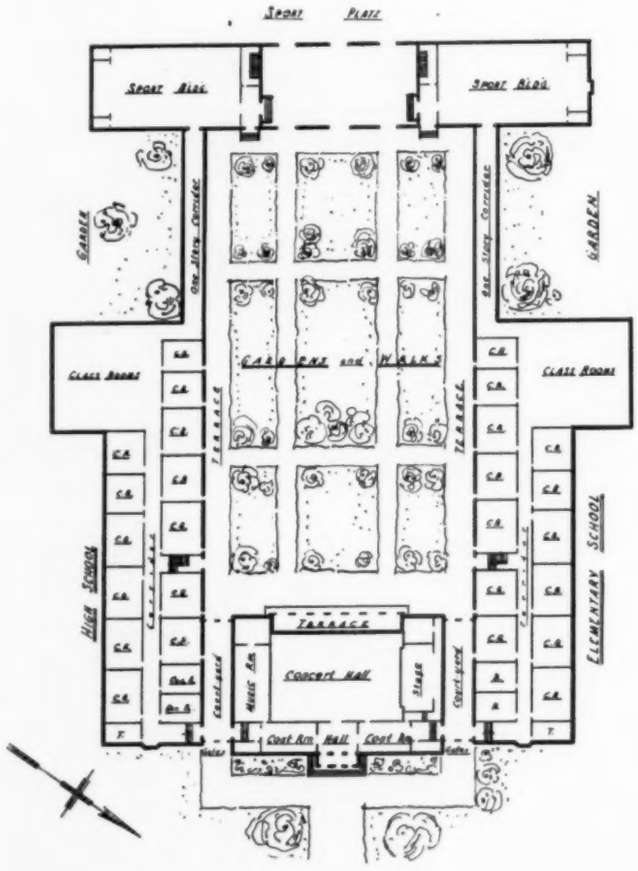
THE WALDDÖRFER SCHULE, HAMBURG-VOLKSDORF, GERMANY

BY BERTHA SMITH

Assistant Superintendent, Department of Education,
Yonkers, N. Y.

THE Walddörfer Schule, Hamburg-Volksdorf, consists of four tapestry-brick buildings connected in various interesting ways and so placed as to completely enclose an extensive oblong court which is utilized for the school yard and ornamental gardens; the whole plant covering an area about equal to a large city block, not counting the huge sport-platz outside the school site proper.

These beautiful edifices are set in a suburban section still delightfully wooded. They include, as is shown in the sketch of the plans, an imposing Sport Building forming the boundary on the short side of the inclosed oblong garden court; two long, low, parallel glass corridors flanking each side of the garden, and each connecting the Sport Building with one of the twin school buildings, the High School on one side and the Elementary School on the other; and the Concert Hall, a one-story building situated on the other short side of the inclosed oblong court, opposite the Sport Building, thus completing the boundary around the court gardens.



Such a plant, with its four large buildings, its connecting corridors and porticoes, is possible only in an undeveloped suburban area where land is not yet prohibitively priced. The Walddörfer Schule, built in 1930, cost R.M. 4½ million. It will fully repay this investment through immeasurable returns in social and educational values, for this institution is the center of community life. It incorporates the neighborhood concepts of church, education, and recreation.

Features of Design—Use of Color

The outstanding features of this school plant are the spaciously conceived buildings; the clever group arrangement around the lovely inclosed garden; the attainment of unity throughout by skillfully planned connections; the adaptation of every device to utilize nature's life-giving, invigorating gifts of sun, light, air, and earth. Every building has windows on the garden; each classroom on the first floor of the two school buildings has a door on the long terraces elevated slightly above the garden level, offering quick access to outdoors. The windows from the outer sides of all the buildings afford long vistas into the surrounding stretches of green sunlit country.

Another important characteristic of the architect's conception is the delightful use of color throughout the buildings. The color scheme is worthy of careful study, for it is subtly employed, with rich variety, delicate balance, and pleasing proportion. A color-starved American, warped by student life in monotonous, blaring, mechanical school environment, may react adversely to the descriptions of color combinations applied in these buildings. But it must be remembered that the colors are mixed in kalsomine, the walls of the rooms are of rough texture, and the results give translucent effects. Then, too, the great spacious stretch of green outdoors which envelops the buildings, offering a neutral background in quiet surroundings, makes rich color not only acceptable but necessary.

The school neighborhood has been developed generally to offer building sites to garden lovers of the higher middle class, but more modest homes are available. The neighborhood houses of tapestry brick harmonize charmingly with the school buildings. Here again an unerring, ingenious sense of art has been exercised in the utilization of color and design to fashion attractive porches, gates, shutters, doors, and garden furniture. Comfort, durability and beauty are evidently the results most desired.

The Sport Building

The school buildings themselves are true architectural expressions of their functions. The important Sport Building, facing the spacious athletic fields, contains turnhalls, gymnasiums, dressing rooms and shower baths for both the girls and the boys of the elementary and high school units. There are two gymnasiums on the first floor of this building. A great bridged exit is broken through the first floor, between the two gymnasiums, thus making possible access to the sport-platz from the school gardens and the school buildings, all of which open into the inclosed garden. These arrangements greatly facilitate group movements.

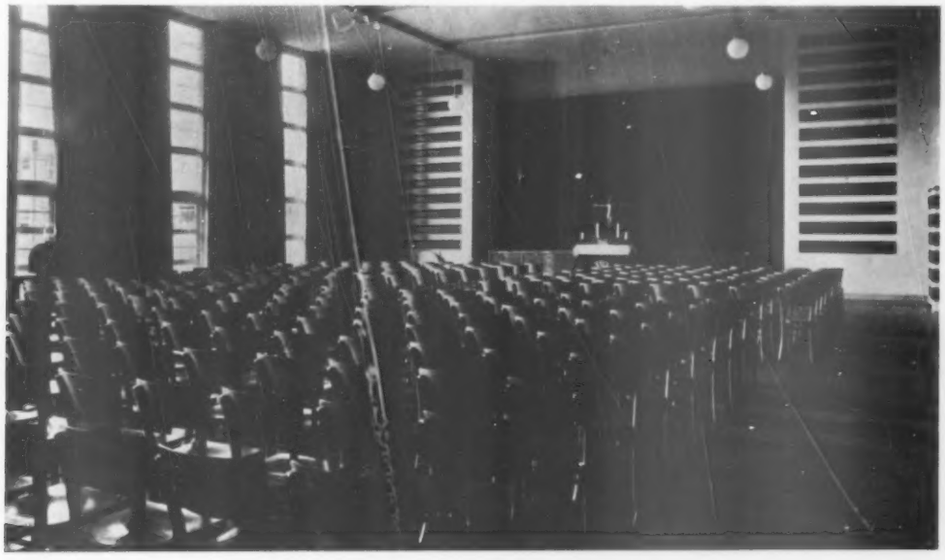
The arched ceiling of one of these gymnasiums is supported by four great curved iron beams, of deep henna color. The lower third of the walls is stone, the upper part is painted in pale henna. The floor is cork. Enormous windows on one side reach the full height of the gymnasium.

There is a smaller, similarly colored turnhall with cork-tiled floors on the second story, which connects with several green dressing rooms. The baths are all on the first floor.

The Concert Hall

The Concert Hall, opposite the Sport Building, is situated at the other end of the inclosed gardens and is effectively unified with the Elementary and High School buildings, respectively on either side, by cleverly constructed connecting brick porticoes which form two entrances from the street to the inner school yard and gardens, and thus to the school buildings, since all open on the garden. Through the gateways are seen vistas of the inner court.

This high, one-story concert saal is entered by two side doors and the grand front entrance, all of which open into the foyer with its convenient wardrobe arrangement. The beautifully proportioned auditorium, with its deep stage designed for orchestral concerts, has a seating capacity of 600. There are dressing rooms on each side of the stage, and a metal curtain for safety.



The Concert Hall Ready for Church Service

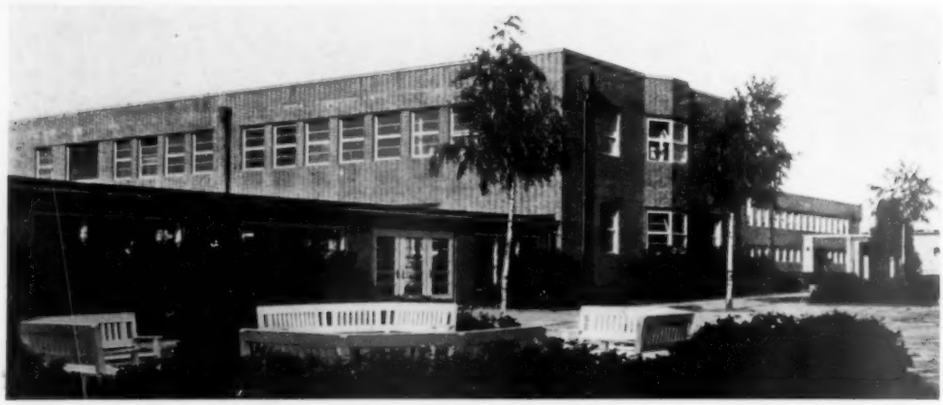
The color scheme adds distinction to this lovely hall. Its walls reflect a delicate rose in two tints; clear spaces alternate with silver, horizontally-barred metal panels, extending from floor to ceiling, some concealing radiators; a putty-colored ceiling, gray woodwork, and comfortable chairs of a soft, rich brown, complete the ensemble.

The stage has blue velvet curtains. The five high, slender windows of the concert saal, curtained in rich olive-brown velvet, have glass doors giving on the pillared outdoor portico from which one may look, full length, over the gardens, to the Sport Building at the opposite end.

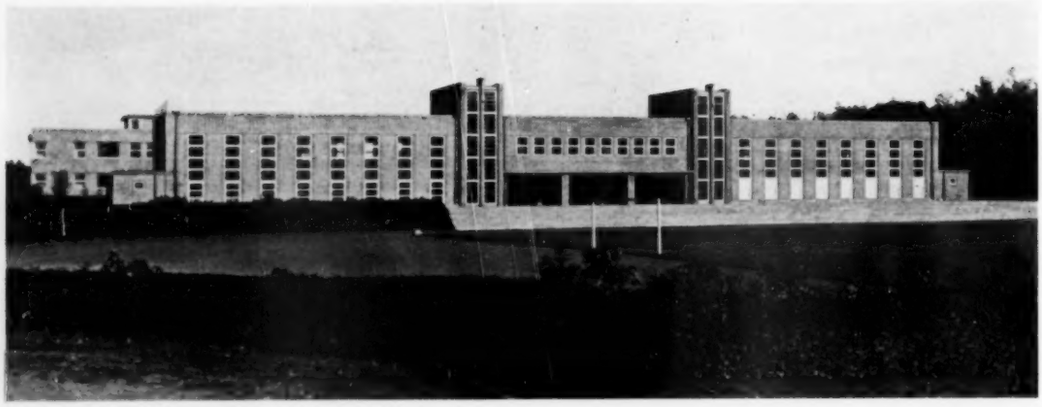
The foyer is a light translucent green, with the doors painted orange on the foyer side.

A music room is back of the auditorium. Here, too, color lends added interest; the walls are bluish, the

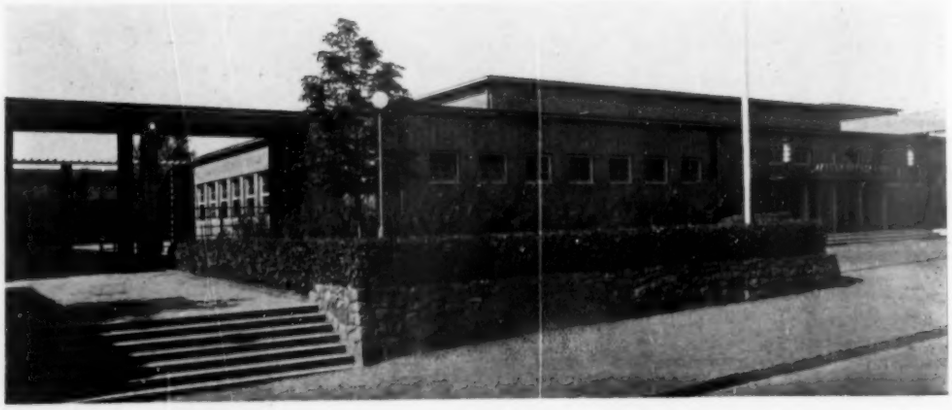
Each First Floor Classroom Has Its Door on the Terrasse



Elementary School Building and One-Story Corridor Leading to Sport Building. High School Identical (opposite)



Sport Building and Sport Platz, Showing Entrances to Inner Garden



Concert Hall from the Rear, Showing the Entrance into the Garden

ceiling a lighter blue, and the doors a pale mustard. The benches, in henna tint, have brown top frames. Curtains of brown velvet finish the color scheme.

This Concert Hall offers the suburban community rich and varied art experiences not only in its extensive program of activities, but through its own loveliness of color and design. Only long acquaintance with its beauties would reveal all the art values inherent in its structure. It is appropriate that the Concert Hall should be adjacent and closely connected on either side to the twin school buildings, the High School and the Elementary School; while at the other end of the garden is the noisier Sport Building, reached by the glass corridors, already referred to.

The regular classrooms of both schools are on the first floor, and, as has been mentioned, each has its own door leading to the gardens. All the windows are large and have four adjustable parts for ventilation. Antique brown furniture contrasts charmingly with parquet floors, walls of pale flesh, and the ceiling with its delicate rosy glow.

The High School

The main entrance to the high school foyer shows side walls of marble, concrete floors and stairs, wrought-iron stair-rails topped with silver bands; a stair-tower with a full-length glass façade revealing views of the gardens from every floor. End walls in the hall are pale yellow; long side walls ivory, with lemon-yellow beamed ceilings. Bulletin boards have henna frames; radiators at each end are also henna. A torquoise-blue tiled fountain is centered against the side walls of the corridors on each floor. At both ends are great scenic windows. Corridors in these schools offer glorious experiences in beauty.

The special rooms of the High School are on the second floor. There is a blue physics room with a beige connecting room, and a laboratory well supplied with apparatus; nature rooms in subtle blues and pinks, stocked with every desirable item; a zoology room with many conveniences. Science is pursued here with ardor.

The art department operates a three-room unit: a drawing-room decorated with frescoes by the students; a modeling room; and a capacious storage chamber.

Nearby is the kino room, all in pale green. Black curtains effectively darken the room for kino purposes. An exhibit room nearby displays the students' history projects.

The faculty rooms express the comfort and beauty of the life-pattern at its best in Hamburg-Volksdorf. A suite of four rooms consists of a well-stocked professional library with ivory walls, with a wide opening into the conference room, decorated in two tints of green and furnished in soft, rich browns. In this room there are corner sofas with convenient small tables; an impressive circular table is obviously for important discussion groups and makes a telling emphasis. The coffee room with its corner sofas and small brown tables is in full view from the conference room. Translucent mustard walls, orange curtains, brown furniture, dark-brown linoleum floors, make this an alluring unit for either relaxation or stimulation. Adjacent wardrobes and kitchenette complete the outfit.

The Director's room, with translucent blue walls, dark-blue linoleum, doors ivory on the room side, orange toward the corridor, lovely rose curtains at the windows, silver lighting fixtures and conveniences of every description, opens on the writing room—a glowing golden room, with curtains of deep-yellow.

It must be an artistic experience to visit the Herr Director, but access to this important personage is not encouraged. The wood-green waiting room adjoining the Director's sanctum is in charge of an intelligent custodian who acts as buffer and prevents needless interruptions.

The Influence of the Gardens

The inclosed school gardens bear an important relation to school and community life and have their part in the philosophy of education upon which this school plant is based. Paths of stepping stones lead to the shade of clustering trees; tempting benches are hidden in shrubbery-inclosed spaces; flower-beds offer sweet odors and happy color effects; fountains and statuary intensify the charm.

The long series of inclosed garden sections assure quiet relaxation; the great green sport-platz in front of the Sport Building provides enormous space for vigorous physical exercise.

The educational buildings concentrated about these lovely gardens, in the middle of a suburban settlement, with every facility for desirable social activities, fittingly epitomize their function in terms of potential neighborhood development.

A community center has been created here which through its unity of purpose and its diversity of offerings stimulates growth for all concerned.

THE JEFFERSON COUNTY HIGH SCHOOL AT VALLEY STATION, KENTUCKY

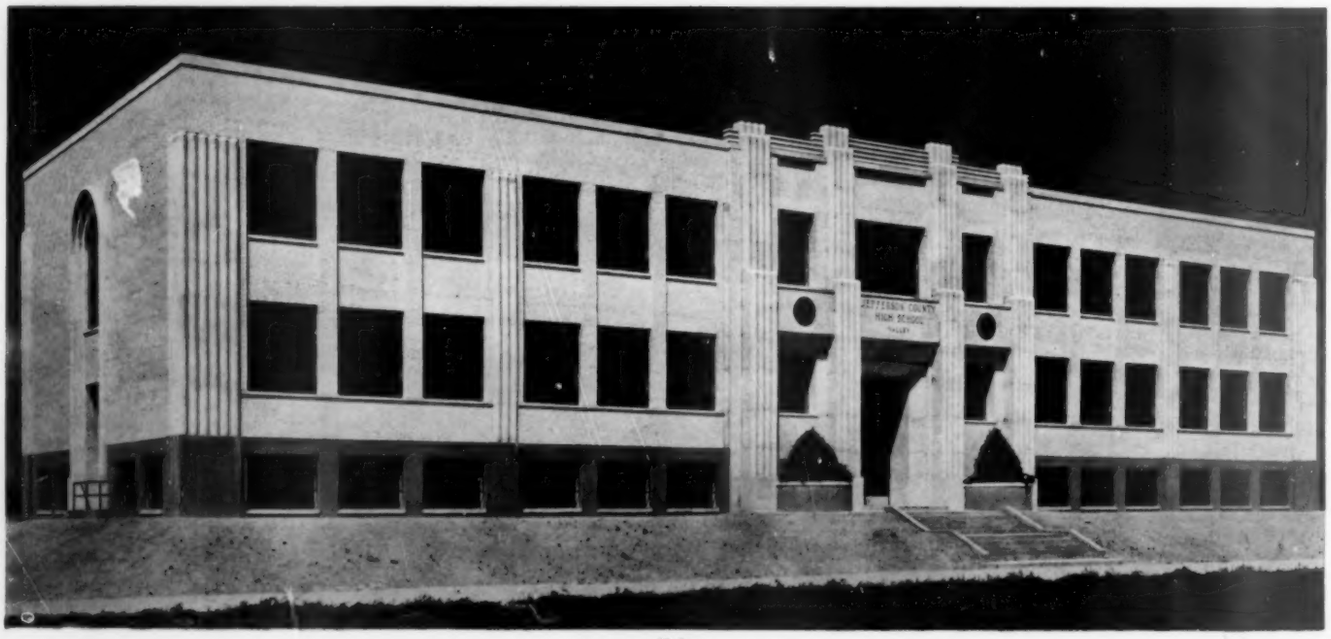
BY ARTHUR G. TAFEL
Architect, Louisville, Ky.

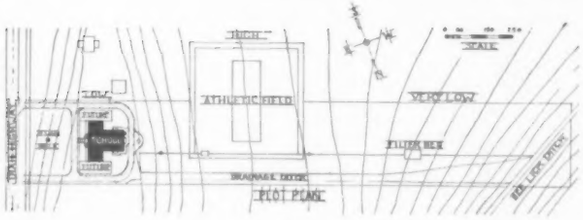
Above—Detail View of Front Entrance

DURING the past ten years the Board of Education of Jefferson County, Kentucky, has carried forward an active program of consolidation which has involved the expenditure of over half a million dollars and the completion of five district high schools. The entirely new high school system and all consolidations were accomplished on a "pay as we go" basis—without selling bonds, borrowing or accepting any outside aid. Cost and other factors considered, the fifth and final high school at Valley Station, Ky., stands out as notably successful.

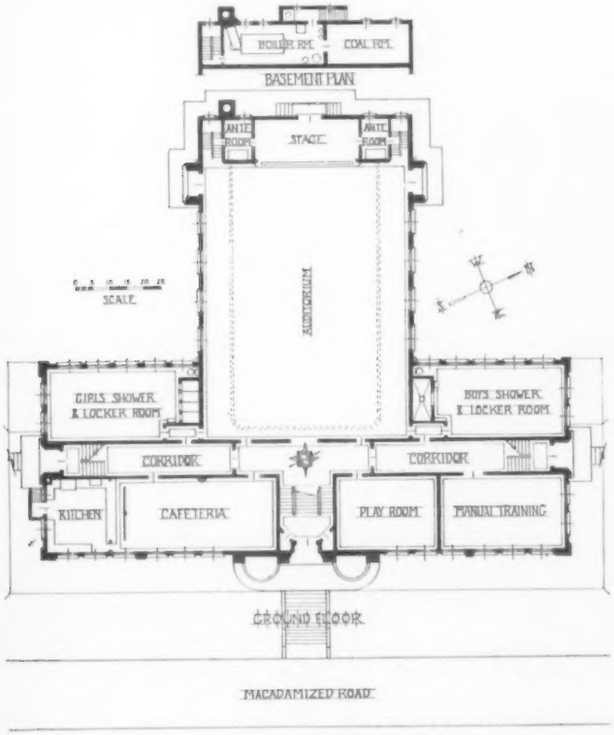
After an exhaustive survey, a 12-acre tract, destined to be the educational center of the fifth district, was purchased. The area now occupied by the building was approximately 4 feet below the highway. The building faces east, with the finished basement or ground floor more than one foot above the original grade. This rather unusual procedure was mandatory for drainage reasons and necessitated a fill of over 1,000 cubic yards of earth to place the building on a pedestal, so to speak. To obtain proper drainage, a ditch over 1,000 feet long, involving a cut of more than 7 feet, was provided to direct surface water to the rear of the tract. In one operation the fill around the building was made, and an inadequate surface drainage from north to south was diverted to the west, with sufficient fall to assure perfect drainage.

Below—Exterior from Dixie Highway



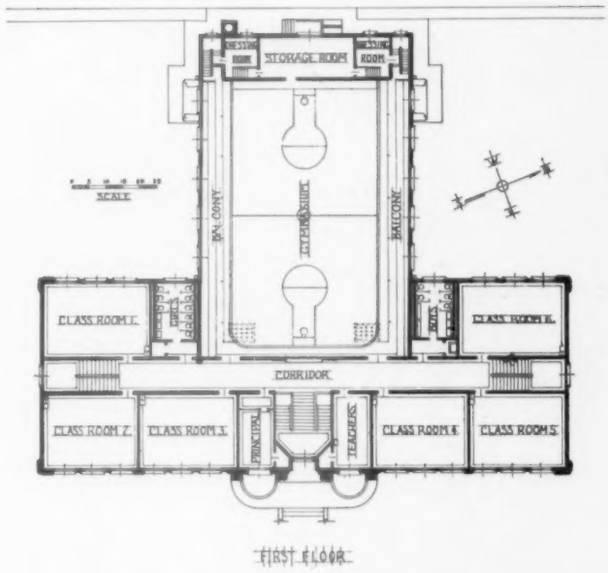


The building is T-shaped, three stories high, with a frontage of 159 feet and a depth of 139 feet. The 20-foot-wide macadamized road, entering from the Dixie Highway at the north and south, completely encircles the school, the front of which is 250 feet back from the highway. The athletic field is at the rear, on high, practically level but well-drained ground. Before any actual building was done, a deep well was drilled, a pump installed, and sufficient water supply assured. A cistern at the rear provides soft water for the steam boiler only.



The Ground Floor

An auditorium with a seating capacity of 1,000, and additional seat-facilities for 500 in the balconies, is also used as a gymnasium. The boiler, coal storage, and pumps are in the basement, below, with anterooms and dressing rooms at either side and storage space over the stage. All auditorium lighting is of a concealed type commonly used in airplane hangars. All walls are of salt-glazed brick-tile, and the ceilings of Masonite, the joints being covered with chromium strips. The basketball banking board at the west or stage end of the auditorium is entirely out of sight, concealed between the ceiling and roof when not in use.

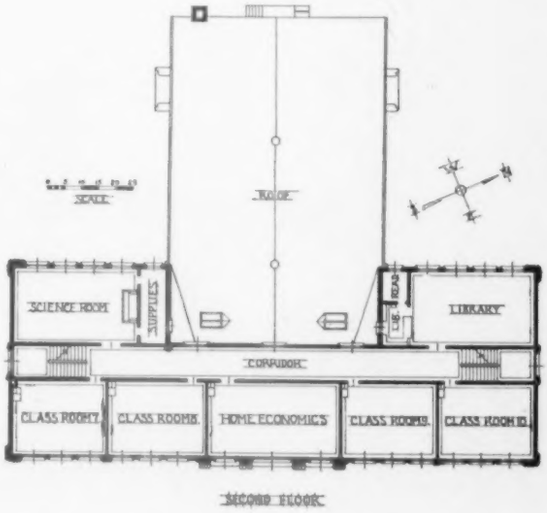


At either side of the auditorium and at the rear of the school building are the boys' and girls' locker rooms (each housing 200 steel lockers), toilets and showers, entered either from the gymnasium or the main corridors through a connecting passageway. The kitchen, with cafeteria counter and lunch room, and the manual training department and playroom, are in front at either side of the main entrance stairway. Five steel stairways serve from the ground floor up, and inside steel and outside concrete steps serve the kitchen and boiler room.

All toilets, lobbies, vestibules, basement stairs, stair landings and corridors throughout the entire building are terrazzo, with terrazzo cove base. The auditorium is heated with two unit heaters, while the rest of the building is heated by direct steam radiation.

The First Floor

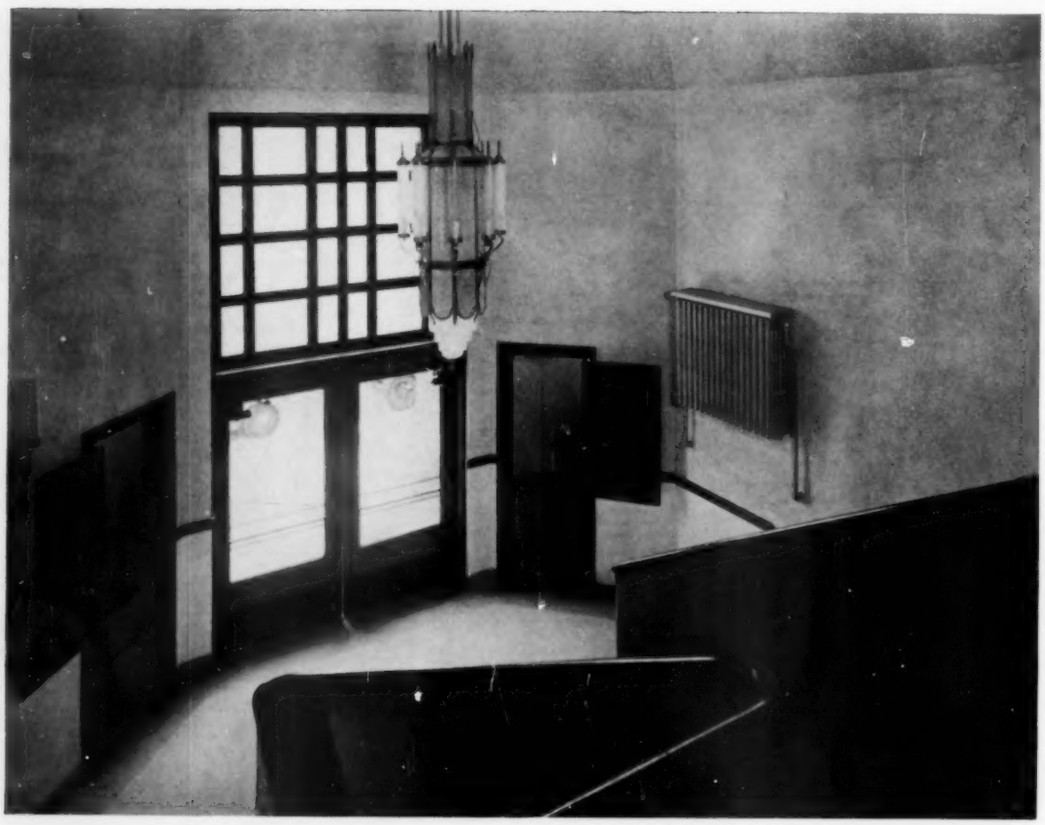
Entering the building from the front, with vestibule ticket offices at either side, one may either go down



Trophy Case, Clock and Bulletin Boards

to the auditorium lobby entrance or up to the first floor and balcony level. Perhaps the only possibility of being accused of extravagance is related to this one main front entrance—and then only to a minor degree. Overhead is a specially designed lighting fixture 3 feet in diameter and 9 feet high, lighted by 25 bulbs. At the foot of the steps, centering the auditorium lobby entrance, is an elaborate meridian using the various colors incorporated in the terrazzo floors, the arrow indicating true north done in white marble chips and white Atlas cement. An inexpensive but highly decorative main entrance is thus attained. At the center of the first floor corridor and at the head of the front steps is a solid walnut trophy case, with a walnut clock over it and a bulletin board at either side. In the belief that "the first impression is always the best," the architect for the first time in ten years' service to this client, but with the full approval of the Board, "stepped out," so to speak. At no other point in the entire building was anything of a decorative nature attempted, the established policy of "as much substantial building per dollar as possible" being adhered to.

The first floor, besides housing the auditorium balconies, consists of the principal's office, with reception area, vault, the broadcasting or central receiving set and outside telephone, teachers' rest room, which is also used as the visiting physician's office, with lavatory and closet for medical supplies, six standard classrooms, the boys' and girls' toilet rooms, centrally



Front Entrance, Showing Ticket Booths

located, and 56 steel lockers built into the corridor walls.

The Second Floor

The second floor houses the library, with librarian's nook and reading room, domestic science room, science room, with large supplies room, and four standard classrooms. There are 85 built-in steel lockers in the second-floor corridor. The entire second-floor ceiling is insulated with sheet metallation. Both the domestic science room and the science room, as well as the kitchen, are provided with the necessary acid-proof drains, hot and cold water, gas and electric outlets where required.

The entire building is cream-colored face brick, with limestone trim on concrete foundations. The floors of all areas are steel bar joist with 3 inches of concrete, and maple floors laid in mastic, except terrazzo areas previously mentioned. Expanded metal lath was used in the whole building, which is plastered throughout, except the corridors, which are cream-colored face brick. Acoustical plaster was used on all corridor, vestibule and landing ceilings, as well as on the soffits of all stairways. Genuine slate blackboards were used except in the library and science room, where other facilities make them unnecessary. Each room has a built-in teachers' cabinet with a modest series of book-shelves and lock-up compartment. Genuine bronze hardware and panic devices of the best make and heaviest design were used, chromium finished outside and black inside. All woodwork, steel stairways and trim are in tobacco-brown

AUDITORIUM WITH BANKING BOARD AND RACK CONCEALED BETWEEN THE CEILING AND ROOF

Ceiling panel (on bottom of banking board rack) in place. Small ceiling panel (to conceal iron basketball ring) being lowered into place as picture was taken. When used either as a gymnasium or an auditorium, the entire ceiling is closed tight, stripped with chromium strips. Rack may be lowered and two stiff arms, to stage, placed in five minutes

Second Floor Corridor, Showing Lockers

enamel to match the steel lockers, steel toilet and shower partitions, etc. The roof areas are abundantly ventilated above insulated ceilings. The exterior approaches and the steps connecting entrances with the macadamized road are of concrete.

No outside lighting fixtures were used, the main entrance stairs being floodlighted with 600 watts of lighting concealed in the stone soffit of the large central doorway. The two side and auditorium entrances are floodlighted by similar fixtures on the ceilings of the entrance vestibules.

Every room, the main corridor, and the auditorium are equipped with an electric clock and program system. Every room, the lunch room and the auditorium have the very latest return program radio system, so arranged that either outside radio programs or victrola records may be broadcast. The principal may address any room separately or all of them at once. He may talk to any teacher over his microphone, the teacher answering over an individual microphone. Finally, the principal may, without the knowledge of the teacher or the children, listen in, or supervise instruction at any time. The use of this system precludes the installation of house telephones and would prove very advantageous in case of fire or other emergency.

Built during the severest winter on record, the entire project, exclusive only of the land and movable furniture such as desks and chairs, cost less than $100,000; and this includes not only the architect's fee but everything in connection with the building, and every improvement on the land, such as the sewage-disposal system, cistern, well, more than a quarter of a mile of macadamized interior roads, concrete walks, grading and flagpole.

THE HEATING SYSTEM OF THE PENNSYLVANIA STATE COLLEGE

BY R. Y. SIGWORTH

**Superintendent of Utilities,
Pennsylvania State College**

THE Pennsylvania State College, an educational institution of approximately 5,000 students, is located in an isolated spot among the mountains of central Pennsylvania. It is served by several bus lines and one independent railroad with one freight train a day.

The main campus comprises 200 acres upon which 70 buildings have been erected, several of these buildings being dormitories. The women students live on the campus while the majority of men students live in the town.

The College was founded in 1863, and has experienced a normal growth since that time, excepting the period of 1925 to 1930, when a marked increase was noted. At present the buildings represent various types of construction.

The College owns and operates its steam, electric and water systems. Water is exchanged upon emergency with the local water company in town. Electric service is continuously exchanged with the network system, but no steam service is available in town.

The heating system of The Pennsylvania State College can be divided into three parts, namely, central plant, distribution lines, and building equipment, each part being a separate unit, and all of equal importance in providing comfort for the occupants of the buildings.

Central Plant

A new central plant, or steam generating station, constructed in 1930, supplies steam heat to all buildings on the campus. Considerable study was given to the location of this plant. It was desirable to provide railroad facilities to the plant for coal supply, to keep the plant at a low elevation, and as central to its load as possible. A prominent location at one of the main entrances to the campus was selected, and a plant was designed that harmonized with the architecture of the other College buildings. The exterior of the building does not indicate that it is a power plant.

The equipment installed within the plant consists of four 614-horsepower Sterling boilers operated at 250 pounds steam and 520° temperature. If the plant were being designed today, 500 to 700 pounds steam pressure with 750° temperature would probably be considered. The boilers are stoker-fired and are capable of generating 200 per cent rating.

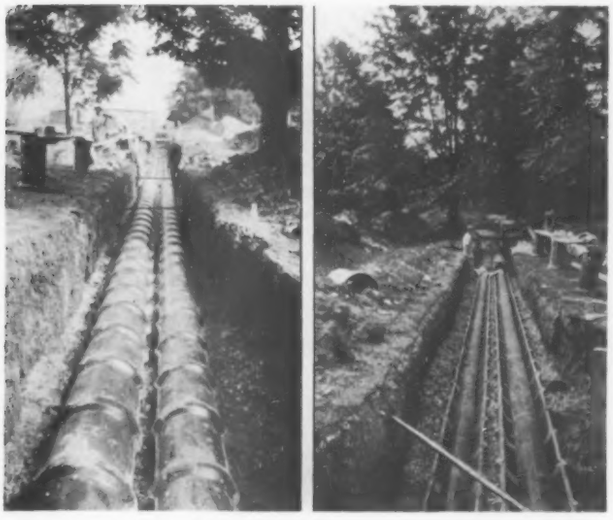
Two non-condensing turbo-generators of 2000 total kva capacity are installed, and all steam going to the heating system passes through these turbines and is exhausted at 8 to 12 pounds back pressure into the heating mains.

In the planning of the plant considerable study was given to future loads and College growth. Ample provisions were made for the installation of additional steam and electric generation equipment.

Distribution Lines

The distribution system consists of two 14-inch and one 10-inch low-pressure main and one 10-inch 35-pound main leaving the plant. These lines maintain 2 pounds pressure at the most remote point in the system, 1¼ miles from the central plant, during extreme low temperatures, with 12 pounds pressure at the central plant. The 35-pound main is used for process work throughout the campus. Several connections are provided to pass this 35-pound steam into the low-pressure lines in case of difficulty in the transmission lines or when the public utility is not able to absorb the electric load. The lines are installed in tunnels in the congested districts in order to provide for future growth and connections, while branches and isolated lines are in conduit buried in the ground. They are usually located under sidewalks.

Steam is maintained on all underground lines the entire year, and domestic hot water is generated in each building by low-pressure steam. Less difficulty



Above—Steam Tunnel Near Central Plant, Showing Construction and Pipe Covering

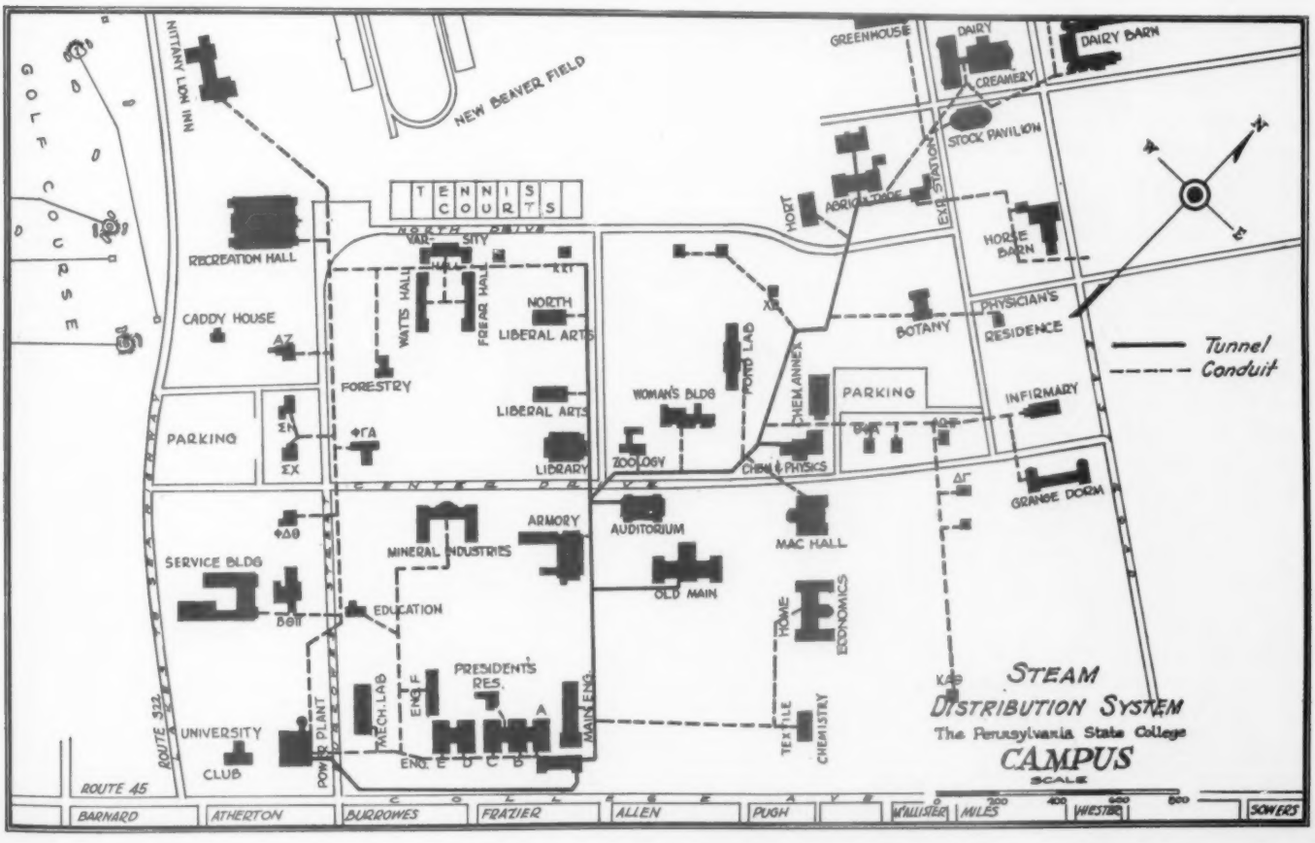
Left—Constructing the Underground Steam Lines. 8-Inch Low-Pressure Line and 6-Inch 35-Pound Process Line to Dairy and Creamery Building

is experienced in expansion joints and in pipe covering when the steam is kept in lines the entire time.

Return lines are run from each building to the nearest low point or pumping station, where vacuum and condensate pumps are installed which maintain 5 to 10 inches vacuum throughout the entire system. The condensate is then returned to the central plant through separate condensate lines. One of these low points is located in the central plant, and two others are located at lower elevations.

A vacuum permits more uniform heating at a lower steam pressure, quieter heating system, elimination of air vents on radiators and mains, quicker return of the condensate, and the use of smaller return lines in the buildings and distribution system.

In some cases it is practicable to waste this condensate to the sewer, or to make some other use of this hot water, especially if the building is remote or lower than the system; providing, however, there is sufficient good make-up water at the central plant.



Building Equipment

The building equipment consists of piping, heating surfaces, valves and traps, control equipment and condensate meters. The piping, heating surface, valves and traps are usually included in the building construction and will not be discussed in this paper.

The heating surface is of sufficient size to maintain the desired inside temperature with the lowest outside temperature. Since the outside low temperature occurs approximately 5 per cent of the heating season, some means must be provided for proportioning the proper steam flow over the remaining 95 per cent of the time. Also, very few college buildings are used 24 hours a day, so it is desirable to reduce the temperature within the building during the unused periods. The structural condition of the building and the outside temperature will determine how far it is practicable to shut steam off buildings during unused periods. It is not practicable to shut steam off a building at zero outside temperature, while at temperatures above freezing, steam can be shut off most of the buildings during unused periods.

The function of the heat control is then to proportion the proper flow of steam to maintain the desired inside day temperature and to regulate the steam flow at night. Several types of these controls are installed in the College buildings, some maintain a continuous flow at reduced pressure, and some operate on a pulsating cycle with steam either on or off. The length of the on and off periods depends on the outside temperature.

In order to maintain uniform temperatures within the buildings in mild weather, it is very desirable to install orifice plates in each radiator valve, thus assuring a more even distribution within the building. The size of the orifice is based on the size of the radiator and the differential pressure across the orifice, providing the radiator is of proper size.

Condensate meters are installed at the outlet of each building which measure the steam used in each building. The meters are all read once a week by a special meter reader, and the steam consumption is studied to determine the efficiency of the heating system.

The steam consumption varies directly with the outside temperature, neglecting small variation for wind velocity and heat derived from the sun. The total amount of cold weather over a given time is expressed in degree days, which is the average daily temperature subtracted from 65 degrees. Sixty-five degrees outside temperature has been selected as the temperature above which no heat is required. The degree day for each day is added to secure the total degree days for the desired period. The comparison is then reduced to a unit figure which will permit the comparison of one building with another. The unit of comparison is best expressed in pounds of steam consumed per cubic foot of volume heated, based on outside dimensions. Each building is then calculated weekly to show the pounds of steam used per degree day per thousand cubic feet.

The efficiency of the heating system of each building at various weekly temperatures is found to be very uniform, providing the building was operated normally during the week. The results are plotted with degree days for the week as the abscissa, and the pounds of steam per degree day per thousand cubic feet as the ordinate. It was found that the heating system is most efficient in cold weather and becomes less efficient as the weather becomes warmer. This is no doubt due to more ventilation during warmer temperature, and the inability of the heat control to regulate the steam properly. It is natural to open windows, rather than close steam valves.

The records show that the average consumption for the entire campus is 2.7 pounds per hour per thousand cubic feet at zero temperature, and a total flow of 54,000 pounds per hour for 20,000,000 cubic feet of volume heated.

Supervising the Heating System

The operation of the entire heating system should be given very close attention and supervision. The central plant should be equipped with meters and instruments in order that the operator may have full information as to the load and distribution. Detailed daily records should be kept of plant operation, such as total coal consumed, total steam generated, total electric current generated, steam leaving the plant through each line, amount of make-up-water, hourly outside temperature, wind velocity and direction, together with all temperatures and pressures. Notation should be made of all irregularities, breakdowns or repairs made by each shift. These records will be very valuable when alterations or replacements are being considered in the central plant.

The distribution system should be given regular inspection, and repairs should be made immediately. The inspection should cover expansion joints, condition of pipe covering, operation of drip traps, entrance of surface water into ducts or tunnels.

The building and building equipment should be given continuous attention. A service man should visit each building daily during cold weather, and at least weekly during warm weather. He should get from the custodian of each building reports of any complaints or irregularities, and all complaints should receive prompt attention.

Each building should be given a detailed study for structural conditions, as follows:

1. Weatherstrip all windows and calk all window frames.

2. Keep the radiators near the outside walls under the windows if possible.

3. Eliminate all unnecessary ventilation. Ventilating equipment is sized to meet extreme requirements. Do not supply ventilation when room is vacant. Do not use outside air to warm-up a building.

4. Determine the hours that heating is required, and see that the steam is shut off for the maximum time at night, on Sundays, holidays, and during vacation periods.

5. Determine the temperature required for the occupancy of the building. Do not heat a shop or storage house to the temperature required in a hospital.

6. Provide some good means of temperature control. No building can afford to be without such a control.

7. Maintain a high vacuum in return lines. If this is not possible, locate and eliminate leaks.

8. Install separate lines for those parts of the building that require long-hour or all-night heating. It is much cheaper than heating the entire building all night.

9. Keep the system in good repair. Worn, damaged or defective valves and traps will not function properly.

10. Cover all steam lines.

11. Do not cover or otherwise obstruct the free circulation of air around radiators; to do so may seriously reduce the heating capacity of a radiator. You cannot make a cupboard out of a radiator.

12. Provide thermometers and recording pressure gages so that the system can be operated properly and intelligently.

13. Investigate every complaint of "no heat"; find the cause and correct it. Do not overheat an entire building to correct a local condition in one room.

14. Measure all steam loads; compare total of loads against total steam generated, and account for all steam generated.

15. *Do not waste heat.*

AN ANNOTATED BIBLIOGRAPHY OF FIFTY-FIVE OUTSTANDING BOOKS ON SCHOOL AND COLLEGE BUILDINGS AND ALLIED TOPICS*

BY WILLIAM J. LOWRY

Superintendent of Schools,
Springfield, Illinois

Books have been included in this list which are relatively recent in publication and which should prove to be helpful to educational executives, architects, and planners in the development and maintenance of superior educational structures.

American Society of Heating and Ventilating Engineers.—Guide 1936—for Heating, Ventilation, Air Conditioning. Volume 14.—Published annually by the American Society of Heating and Ventilating Engineers, New York. 1,080 pp. $5.00.

Supplies much valuable information which can be utilized by educators, with especial reference to improved standards for heating and ventilating systems, though designed primarily for use by engineers.

Architectural Planning of the American College.—By J. Frederick Larson and Archie M. Palmer. McGraw-Hill Book Co., New York. 1933. 181 pp. $2.00.

Provides a significant volume on the planning of the college campus and the various types of college buildings which will be found helpful to college officers and to architects. The various chapters treat of the styles in college architecture, the selection, service and compensation of the architect, campus planning, and the details of spaces devoted to administration, class work, laboratories, student residences, and student recreation. It has been produced by the Association of American Colleges, which vouches for the value of the materials included within its covers.

A Bibliography of School Buildings, Grounds, and Equipment.—Bureau of Cooperative Research, Indiana University, Bloomington, Ind. Part I, by Henry L. Smith and Leo M. Chamberlain. 326 pp., 1928, 75¢; Part II, by Henry L. Smith and Forest R. Noffsinger, 182 pp., 1933, 50¢; Part III, by Henry L. Smith and Forest R. Noffsinger, 130 pp., 1933, 50¢.

Gives a comprehensive bibliography for this field in Part I. The two latter bulletins include additional references necessary to bring Part I up to April, 1933, and should be used in conjunction with it, as there is no overlapping of references.

* The aid of Dr. John W. Sahlstrom, Superintendent of Schools at Elmira Heights, N. Y., Dr. William B. Featherstone, Assistant Professor of Education, Teachers College, Columbia University, S. J. Smith, Assistant Superintendent of Schools, New Rochelle, N. Y., N. L. Engelhardt, Jr., and others in the preparation of this list is acknowledged.

Building and Equipment for Home Economics.—By Melvin Brodshaug. Bureau of Publications, Teachers College, Columbia University. 1931.

Analyzes thoroughly the planning of home economics suites. The purpose of the investigation was to evaluate present practice and to determine as objectively as possible the characteristics of well-designed home economics plants. Building problems, space allotments, and equipment are given extensive treatment. The suggestions arising from the study should be valuable to those responsible for the planning of home economics departments.

Campus Standards for Country Day and Boarding Schools.—By G. D. Strayer, N. L. Engelhardt, and T. C. Burton. Bureau of Publications, Teachers College, Columbia University. 1930. 51 pp. $1.00.

Shows a campus score card for country day and boarding schools which lists more than 70 separate items that contribute toward the most desirable campus. The score card is followed by a description of what should be considered an ideal situation for each item. The arrangement of the booklet is such that a very fair appraisal may be made of any campus.

Check List Materials for Public School Building Specifications.—By Lee Byrne. Bureau of Publications, Teachers College, Columbia University. 1931. $2.35.

Furnishes a scientific analysis of a large number of building items which should be included in such a document.

College Architecture in America.—By Charles Z. Klauder, and Herbert C. Wise. Charles Scribner's Sons, New York. 1929. 301 pp. $5.00.

Presents a comprehensive discussion of the present-day theory and practice of college architecture, which is distinctly American, adapted to climate, environment, and other physical conditions, as well as to the rapidly advancing methods of collegiate education. Even though this book does not purport to be a book of plans, floor plans or development plans appear on some 60 pages of the book. There are equally as many pages devoted to representative samples of the types of architecture existing on the American college campus.

The College Library Building: Its Planning and Equipment.—James T. Gerould. Charles Scribner's Sons, New York. 1932. 116 pp. $2.00.

Provides a handbook of principles and standards to assist in the interpretation of the needs preparatory to the planning of an effective and flexible college library building.

Construction et Amenagement des Ecoles Maternelles.—By Mlle. S. Bres. Published by Delagrave, 15, Rue Soufflot, Paris. 44 pp.; illustrations and diagrams. (No date.)

Gives a great deal of pertinent information regarding infant or nursery schools. Construction and equipment of this increasingly popular type of school are fully described. A typewritten translation by Walter M. Wallack is available.

Das Berliner Schulwesen.—By Jens Nydahl. Wiegandt and Grieben, Berlin, Germany. 1928. 607 pp.

Supplies a very comprehensive report on school methods, school curriculum, and other educational aspects of the school problem of this city, now probably modified. It contains many pictures of school activities and educational achievements. A section of this report is devoted to plans of school buildings as well as to photographs of fairly recently constructed buildings in Berlin.

Der Neue Schulbau.—By Julius Vischer. Julius Hoffman, Stuttgart, Germany. 1931. 102 pp.

Contains many photographic illustrations and plates. The outstanding volume available in Europe illustrating the new schools of Germany, Holland, Switzerland, England, Denmark, and America.

Desirable Physical Facilities for an Activity Program.—By Frank M. Long. Bureau of Publications, Teachers College, Columbia University. 1933. $1.60.

Studies twenty progressive schools intensively to determine what physical facilities were being provided for kindergarten and the first six grades of the elementary school. This study included not only the buildings, but also the equipment and grounds. Classroom standards are derived to conform to changes which are being advanced for elementary school procedures.

Ecoles.—By Poulain Roger. Vincent Freal et Cie, 4 Rue des Beaux Arts, Paris, France.

Includes many illustrations of recently erected schools in France and elsewhere and presents splendid views, especially of exteriors.

Edifici Scholastici Italiani, Primari E. Secondari.—By Luigi L. Secchi, Ulrico Hoepli, Milano. 1927. 228 pp. 52 plates.

Presents a complete treatment of Italian school buildings and equipment. It is particularly interesting for its presentation of the Italian style of architecture, which is so closely akin to our "California" type. The plates are large and well drawn.

Efficient Business Administration of Public Schools.—By George F. Womrath. Bruce Publishing Co., Milwaukee, Wis. 1932. 461 pp.

Concerns itself largely with problems of buildings—their location, construction, operation, equipment and maintenance—and contains a valuable chapter on portable schoolhouses. This general work on school administration is the contribution of a practical educator, an authority in the field.

Elementary School Building Score Card and Survey Manual.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1936. 48 pp.

Permits of the intensive study of elementary school buildings under uniform conditions. It is in handbook form prepared for use in school-building surveys. Its contents and arrangement have grown out of such surveys made by the author in many school systems throughout the United States.

Extra Costs and Incidental Costs in the Erection of School Buildings.—By Frank M. Misner. Bureau of Publications, Teachers College, Columbia University. 1934. 79 pp. $1.60.

Furnishes the only scientific study of so-called "extra" costs involved in the erection of school buildings. The author presents a check-list which will enable the architect to reduce the percentage of "extras" resulting from failure to consider all elements of planning.

For Better Schoolhouses.—By Fletcher B. Dresslar, S. L. Smith, Haskell Pruett, and others. Interstate School Building Service, George Peabody College, Nashville, Tenn. 1929. (First edition exhausted.)

Gives perspective sketches of school buildings, floor plans, perspectives of school grounds, suggestive specifications, and contract forms. The buildings represented are classified according to teacher capacity, ranging from one to fourteen teachers, with the greater space accorded the one-, two-, three-, and four-teacher schools. One section is devoted to community houses, teacherages and other special buildings.

Furnishings and Equipment for Residence Halls.—By Mary De Garmo Bryan and Etta M. Hanby. Bureau of Publications, Teachers College, Columbia University. 1933. 95 pp. $1.05.

Considers the many factors which enter into the selection of furnishings and equipment for residence halls. The size of the hall, type of resident, service to be rendered, rate to be charged, and the funds available, are discussed. Emphasis is placed on the careful cooperation of the architect, the committee or staff members concerned with the interior decoration, and those responsible for the management of the building.

Grade School Buildings.—By William Conrad and William George Bruce. 2 vols. Bruce Publishing Co., Milwaukee, Wis. 1925. 400 pp.

Presents the work of some of the outstanding school architects in the United States and contributes many valuable suggestions relating to school-building planning and construction. These volumes consist of articles and excellent illustrations which appeared originally in the *American School Board Journal*.

High School Buildings and Grounds.—A Report of the Commission on the Reorganization of Secondary Education, appointed by the National Education Association.—United States Bureau of Education, Bulletin 1922, No. 23. 49 pp.

Treats briefly and clearly certain school-building requirements, such as maximum safety, adequate lighting, good ventilation, practical economy and architectural beauty, which are common to all schools. A section of this treatise deals with the building problems of the small high school.

Improvement in the Maintenance of Public School Buildings.—By H. M. Schwartz. Bureau of Publications, Teachers College, Columbia University. 1926. 74 pp.

Informs those who are desirous of ascertaining the probability of repairs in various elements of school buildings and the effect upon costs when repairs are made at certain times.

L'Architecture D'Aujourd'hui—Ecoles. A compilation published by L'Architecture D'Aujourd'hui, 5, Rue Bartholdi, Boulogne-Sur-Seine, France. May, 1934.

Acquaints those who so desire with modern European school architecture and school equipment. Architects, particularly, should consult this lavishly illustrated volume, which is one of a series on types of French buildings. It will astound the average American who believes that this country displays the last word in modernity of educational plants.

The Location of City School Plants.—By L. Leland Dudley. Harvard Bulletins in Education No. 14. Harvard University Press, Cambridge, Mass. 1929. 130 pp.

Offers sound criteria for school-plant planning in the selection of desirable school sites. A well-organized monograph which has drawn from current school-building surveys such pertinent information and technics necessary to the solution of school planning problems.

Measurement and Interpretation of School Building Utilization.—By Edgar L. Morphet. Bureau of Publications, Teachers College, Columbia University. 1927. 102 pp. $1.60.

Analyzes buildings which are reported by school principals as "overcrowded." The author has discovered the degree of utilization for each type of educational space and has set up criteria against which the utilization of plant may be measured.

Modern School Buildings, Elementary and Secondary.—By Sir Felix Clay. B. T. Batsford, Ltd., 94 High Holborn, London. 3rd ed., 1929. 208 pp.

Reports the English viewpoint and practice in regard to school-building design, situation and construction. The book is well illustrated with photographs of notable buildings and interiors and with many drawings of floor plans and details.

The New World Architecture.—By Sheldon Cheney. Longmans, Green & Co. New York. 1930. 404 pp. $10.00.

Gives us a handsome and profusely illustrated volume devoted to modern buildings and their treatment which includes some school structures among those illustrated and described. The author's explanation of modern design, comparisons of older types with the new, and the projection of his ideas into the future, make this a most entertaining and valuable volume.

Our Cities Today and Tomorrow.—By T. K. and H. V. Hubbard. Harvard University Press, Cambridge, Mass., 1929. 389 pp. $5.00.

Touches the schools only incidentally as one element in an embracing city planning scheme, but the location of school sites, the type of architecture employed in construction, and the utilization of school playgrounds for community use, are all shown as important phases in the correlation of civic construction enterprises.

The Planning and Construction of School Buildings.—The Thirty-Third Yearbook of the National Society for the Study of Education. N. L. Engelhardt, Chairman. Public School Pub. Co., Bloomington, Ill. 1934. $2.50.

Supplies a comprehensive study of the field of school-building planning and construction by leaders in the educational field. It reflects the most recent thought and practice on the subject. Emphasis has been placed upon those difficulties involved in school-building planning for the solution of which the board of education and the superintendent of schools frequently have sought in vain. Chapters dealing with the selection of the school architect, extra costs in school-building instruction, forms of architects' contracts, the character of working drawings, specifications and the like are of particular interest to architects.

Planning Residence Halls.—By Harriet Hayes. Bureau of Publications, Teachers College, Columbia University. 1932. 247 pp. $2.25.

Provides a handbook for the use of college officers and members of building committees. Part One includes the essential details of preliminary consideration; Part Two develops the desirable physical facilities to be included; Part Three sets up provisions for safety and general welfare with reference to heating, ventilating, and lighting.

Planning School Building Programs.—By N. L. Engelhardt and Fred Engelhardt. Bureau of Publications, Teachers College, Columbia University, New York. 1930. 570 pp. $5.00.

Furnishes a comprehensive treatise on all phases of school-plant analysis. This text treats critically and completely of the techniques and principles involved in plant planning, covering such items as site selection, cost of school sites, city planning and the plant program, architectural service and the building program, school-building costs, financing and cost of school-building programs, and many other phases of the work.

Practical School Economies.—By Henry H. Linn, Bureau of Publications, Teachers College, Columbia University, New York. 1934. 461 pp. $3.15.

Gives a complete treatment of the field of school business administration showing savings that are possible under proper management and supervision. Chapters IX-XIII will prove particularly valuable to those engaged in construction, financing, or administration of school buildings. This work is immensely practical and covers the field thoroughly.

Public Elementary School Plant.—By Charles L. Spain, Arthur B. Moehlman, and Fred W. Frostic. Rand McNally & Co., New York. 1930. 602 pp. $4.00.

Approaches the problem from the standpoint of the basic educational policies in terms of which all school-plant planning must proceed. Elementary education is considered in three phases: (1) traditional; (2) transitional; and (3) the probable school of the future. Methods of determining space requirements and the relative physical efficiency of plan types are followed by a discussion of the technique of designing an elementary school plant. The text is generously interspersed with plates and floor plans illustrating the factors discussed.

Public School Plant Program.—By Arthur B. Moehlman. Rand, McNally & Co., New York. 1929. 405 pp. $3.00.

Presents authoritatively the principles underlying the organization and administration of school plant programs. A practical technique for appraising the present plant and determining the needs of the ultimate plant in a given school situation is also presented.

Public School Plumbing Equipment.—By Minor W. Thomas. Bureau of Publications, Teachers College, Columbia University. 1928. 128 pp. $1.60.

Treats of the sanitary and practical aspects of school plumbing from the viewpoint of the superintendent of schools and sets up criteria for judging good plumbing equipment to guide one in the selection and arrangement of such equipment in a modern school building.

Report of the Survey of Schools of Chicago, Ill., Vol. IV. George D. Strayer, Director.—Housing the Schools, by F. W. Hart and N. L. Engelhardt; **The Operation of the School Plant,** by George F. Womrath. Bureau of Publications, Teachers College, Columbia University. 1932. 315 pp. 75¢.

Gives an accurate picture of the schoolhousing situation in America's second greatest city and describes fully how the plant has been operated. Its recommendations embody "what not to do" as well as "what to do," and it should be studied in every city school system.

Rural Schoolhouses, School Grounds, and Their Equipment.—By F. B. Dresslar and Haskell Pruett. Bureau of Education, U. S. Department of the Interior, Washington, D. C., Bulletin No. 21, 1930. 14 pp.

Furnishes a rich mine of information regarding function, location, planning and adapting for those who have to deal with rural school design and construction. It is abundantly illustrated and contains suggestive floor plans and specifications.

Safeguarding the School Board's Purchase of Architects' Working Drawings.—By A. M. Proctor. Bureau of Publications, Teachers College, Columbia University. 1931. 138 pp. $2.10.

Shows the inadequacies of laws and practices with respect to working drawings for school buildings. The author includes a check-list growing out of his study of these inadequacies which will assist school boards and superintendents of schools in their analysis of working drawings and in safeguarding their purchases of architectural service.

School Architecture: Principles and Practices.—By John J. Donovan and others. Macmillan Co., New York. 1921. 724 pp. $20.00.

Indicates clearly desirable architectural practices in modern school erection, as advocated by Mr. Donovan and his collaborators in a comprehensive treatise. Building planning, construction costs, departmental equipment, heating and ventilation, and electrical installations, are a few of the topics that provide a wide fund of information. This volume is profusely illustrated with pictures of all types of buildings,

various types of rooms, laboratories and offices, and with suggestive floor plans.

School Building Management.—By C. E. Reeves and H. S. Ganders. Bureau of Publications, Teachers College, Columbia University. 1928. 395 pp. $3.75.

Provides the first comprehensive book yet available covering the care and operation of school buildings. It is a manual and book of reference for those who are responsible for the maintenance of school-building conditions at a high level. It gives standards for measuring the efficiency of operation, and concrete help that will facilitate the work of janitor-engineers and other employees about a school plant.

School Building Problems.—By George D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1927. 500 pp. $5.25.

Brings together a collection of the school-building problems which superintendents of schools are required to solve. The topics covered include population studies, the location of school buildings, the selection of architects, adequate plans and specifications, school-building contracts, the planning of new high and elementary schools, equipment planning, and financing new buildings and equipment.

School Building Programs in American Cities.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1928. 560 pp. $5.00.

Presents a cross-section study of school-building conditions in the United States—North, South, East, and West. It illustrates clearly by definite reference to specific cases and places how school-building programs have been developed. The variety of situations presented enables a superintendent to adapt the specific methods of study to his own local conditions.

School Buildings, Grounds, Equipment, Apparatus, and Supplies.—T. C. Holy, Chairman. *Review of Educational Research,* December, 1932. pp. 343-441. American Educational Research Association, Washington, D. C.

Supplies a comprehensive review of the technics and procedures followed in school-building surveys, in site selection, and in the planning and equipment of school buildings. Direct references are made to research volumes, building surveys, and other studies that have bearing upon this field. This comprehensive survey will bring the reader up to date with reference to the literature on school buildings and the contributions that each study has made to this field.

School Buildings of Today and Tomorrow.—By W. K. Harrison and C. E. Dobbin. Architectural Book Publishing Co., Inc., New York. 1931. 233 pp. $16.50.

Describes and discusses the design of the school building of yesterday and the school of tomorrow in Part I. Part II presents plans and illustrations of a group of modern schools in foreign countries. Part III discusses the advantages of standardization and submits plans and illustrations to show how this system operates in the New York schools. The volume is replete with attractive illustrations, detailed plans and diagrams.

School Ventilation—Principles and Practices.—New York Commission on Ventilation. Bureau of Publications, Teachers College, Columbia University. 1931. 73 pp. $1.00.

Furnishes the final contribution of the Commission, whose work was financed by the Milbank Memorial Fund, 1913-1923, 1926-1929. The summary of conclusions is most significant in that it finds no justification for the extensive mechanical equipment so generally required by law and practice.

Some Administrative Problems of the High School Cafeteria.—By Willard S. Ford. Bureau of Publications, Teachers College, Columbia University. 1926. 191 pp.

Suggests layouts for school cafeterias and sets up standards for determining room sizes and space relations.

Some Code Controls of School Building Construction in American Cities.—By John W. Sahlstrom. Bureau of Publications. Teachers College, Columbia University. 1933. $1.60.

Recounts a significant investigation of the effects of municipal building codes upon the construction of school buildings. It relates the particular needs of the school to technical regulation of construction. Its purpose is to assist responsible school officials in the improvement of municipal and state building codes with respect to those aspects that affect school-building construction or add unnecessarily to school-building costs.

Standards for Elementary School Buildings (eighth and revised edition).—By G. D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1933. 181 pp. $1.70.

Presents a revision and enlargement of the earlier *Standards* in the light of recent research and advanced thought on the subject. The *Standards* and the *Score-Card* constitute an indispensable instrument (1) in the surveys of existing school-building conditions preparatory to the formulation of an adequate building program, and (2) to help boards of education, superintendents of schools, and architects in checking the adequacy of plans for new buildings.

Standards for High School Buildings.—By G. D. Strayer and N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1924. 95 pp. $1.05.

Gives score-card for buildings, standards of construction, methods of evaluating, and an explanation of the use of the score-card.

Standards for Junior High School Buildings.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1932. 155 pp. $1.60.

Indicates how educational programs and educational methods affect the planning of junior high schools. The latest of the series of standards for public school buildings establishes standards for physical facilities to be included in the modern junior high school building.

Standards of School Lighting.—Prepared under the joint sponsorship of the Illuminating Engineering Society and the American Institute of Architects. 1932. 39 pp.

(It is understood that a revised edition will be issued some time during the next year.)

A Standard State Schoolhousing Code.—By Frank W. Hart, C. F. Williams & Sons, Inc., Albany, N. Y. 1924. 172 pp.

Presents the building codes of all the states in tabular, easy-reference form and gives a complete set of standard forms which can be utilized for orderly and efficient control of a school-building program from inception to completion. A new edition is needed.

Survey Data Book and Standards for Operation and Maintenance of Physical Plant in Colleges and Universities.—By N. L. Engelhardt, C. E. Reeves, and Parl West. Bureau of Publications, Teachers College, Columbia University. 1935. In mimeographed form. 148 pp. $1.00.

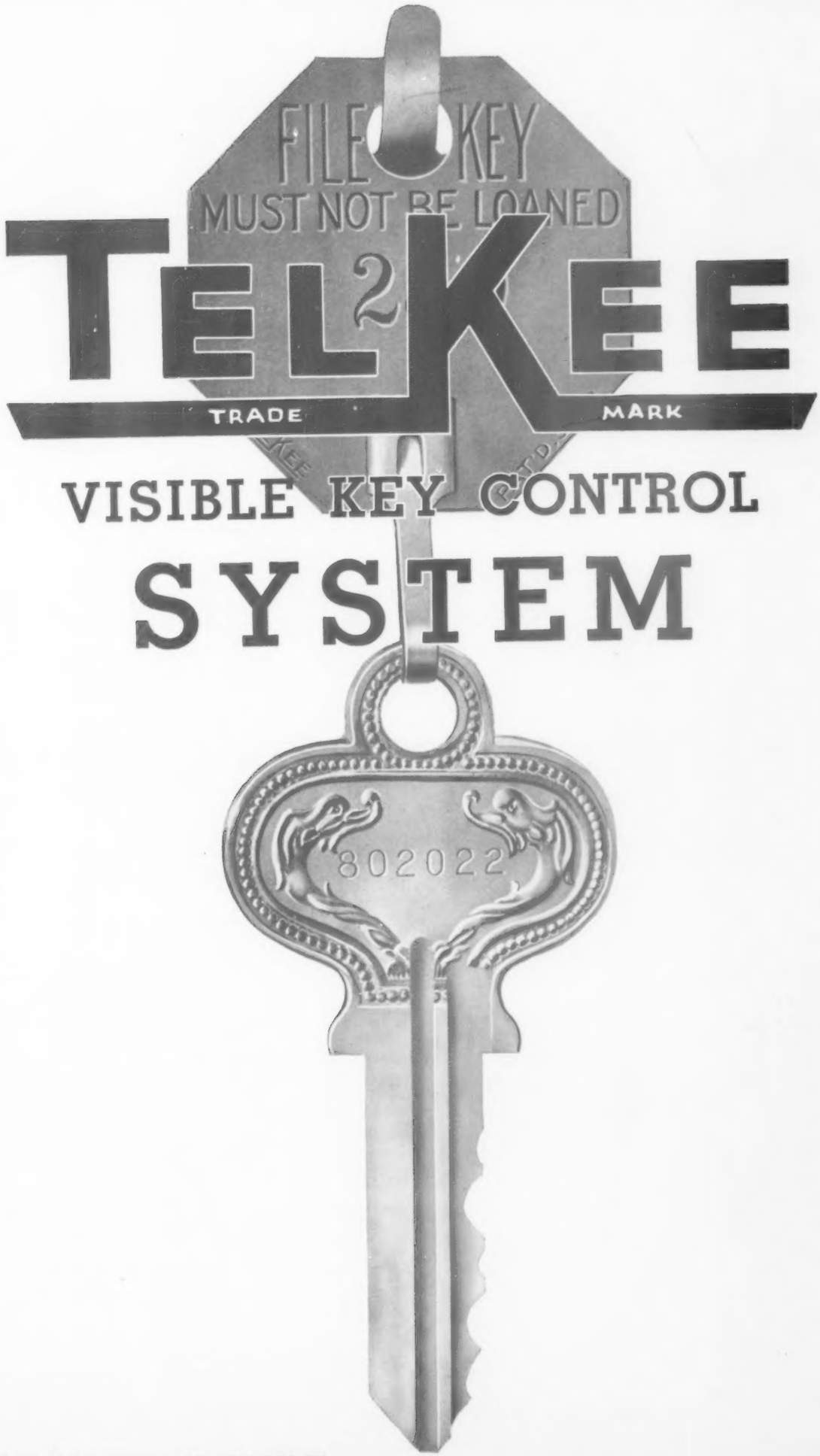
Furnishes the first volume that has been prepared on the operation and maintenance of the physical plant in colleges and universities. The information included here can be used to train the operation and maintenance staff now in service or to make a comprehensive survey of conditions to be found in any one single plant.

Survey Field Book for the Analysis of a High School Building.—By N. L. Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1931. 45 pp. 55¢.

Permits of the analysis and detailed study of plans for modern high school buildings or of existing high school plants.

Survey Manual for the Business Administration in Public School Systems.—By N. L. Engelhardt and Fred Engelhardt. Bureau of Publications, Teachers College, Columbia University. 1936. 156 pp.

Appraises all aspects of school business administration. Section X is devoted to the analysis and the rating of the work of business administration associated with school-building planning. Standards for school-plant planning, architectural service, educational service, and construction service are incorporated and used as the basis for rating the services rendered in the local school system.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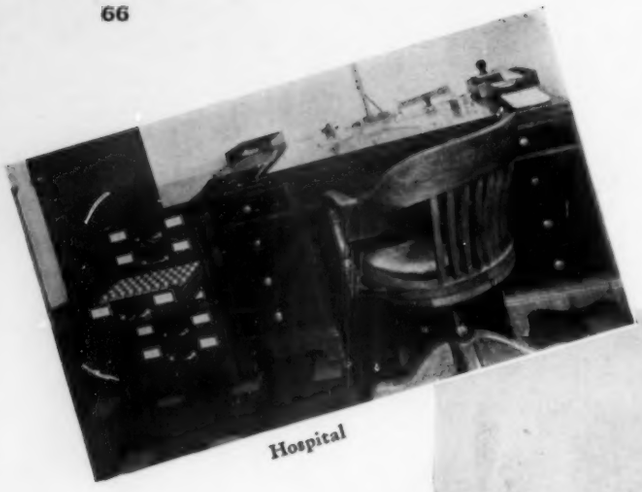
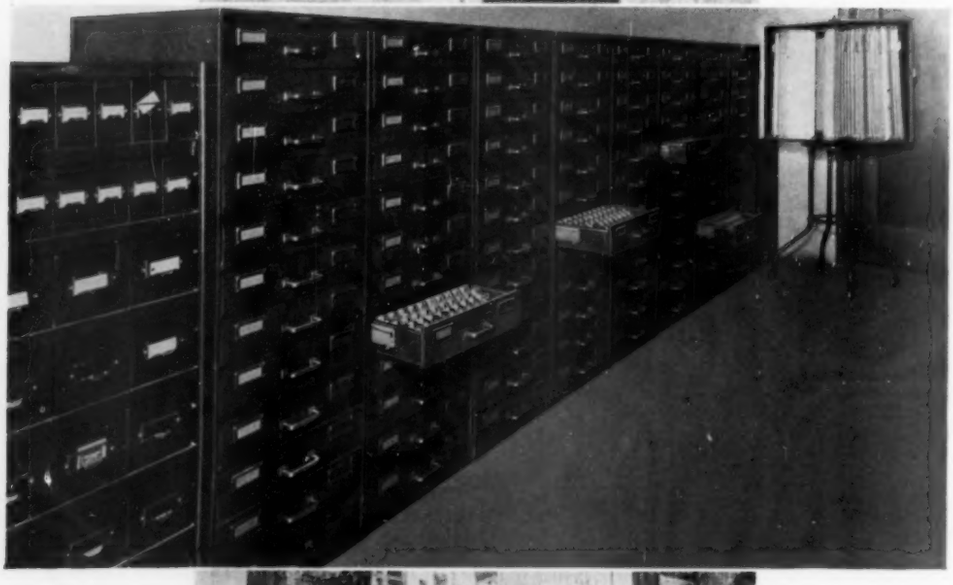
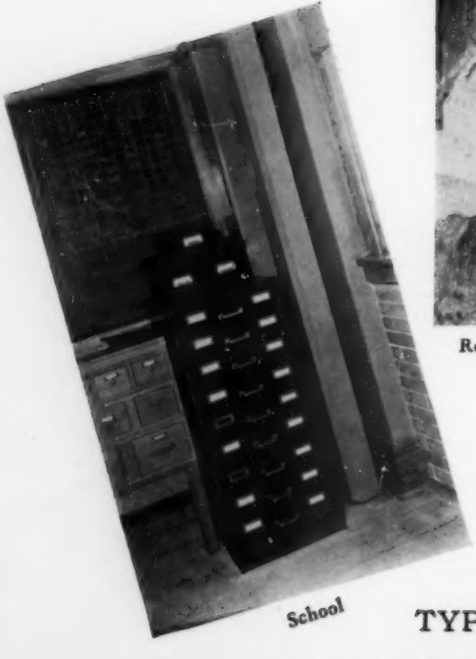


Hospital

Apartment House



Rockefeller Center, RCA Building and Central Key Control Installation



School

Bank

TYPICAL TELKEE INSTALLATIONS

THE AMERICAN SCHOOL AND UNIVERSITY

TELKEE KEY CONTROL

Manufactured by

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TELKEE REPRESENTATIVES IN PRINCIPAL CITIES

TELKEE TRADE MARK KEY CONTROL

Many millions of dollars are spent annually for locks and keys to furnish privacy or to secure valuables against prying eyes and thieving hands.

When population was scattered, buildings small and management more personal, the control of keys offered no problem. A "key rack" furnished by the local carpenter with cup hooks and with paper identification tags for keys solved most requirements.

With the advent of the "skyscraper," the hospital for hundreds of patients, the school for thousands of pupils, large businesses with tens of thousands of employees, the problem of maintaining locks and handling and controlling keys became a major problem **if the original value and purpose of the locks were to be preserved.** It is nothing extraordinary today to have accumulations of thousands, tens of thousands, of locks in one institution with two to five times that number of keys. With the complexity of modern society even a modest family with house, garage, automobile, cabinets, trunks, bags, etc., frequently has an accumulation of fifty to a hundred locks with their attendant keys.

The mere housing alone of these accumulations of keys became a confused and confusing problem. Demands were made for a better, a more comprehensive and systematized method of housing and controlling; for a simple, easily operated system that would eliminate the confusion and lack of control of the older methods and reduce the rising costs of lock maintenance, variously estimated at from 50¢ to $1.50 per lock per year during the life of a building.

TelKee is offered in response to this demand and as a solution of these problems. We thank the Architects, Building Hardware Manufacturers, many Building Superintendents and Business Managers who have assisted us with their experience and counsel.

Exposition of the TELKEE VISIBLE KEY CONTROL *System*

CENTRAL KEY CONTROL

To obtain continuity of control and the best results from any systematic method of handling keys, all authorities are unanimous that key maintenance should be placed in General Executive Offices.

Here in cabinets should be a Reserve-Pattern or Record key to every lock in the building or buildings, all Duplicate keys not issued to departments, employees or tenants, and signature receipts for all keys issued. Here should be the supervision, the issuance of keys to, and their recovery from departments and individuals and the ordering of necessary additional duplicates. This control should include not only the room and entrance keys but also keys to all lockers, files, desks, cabinets, etc.

In the larger Institutions and Corporations having many buildings and departments, additional smaller capacity cabinets are necessary in building maintenance departments, also frequently in laboratories, shops, etc., but they should contain only keys in active daily use in the departments and be entirely supplemental to the Master File in the executive office.

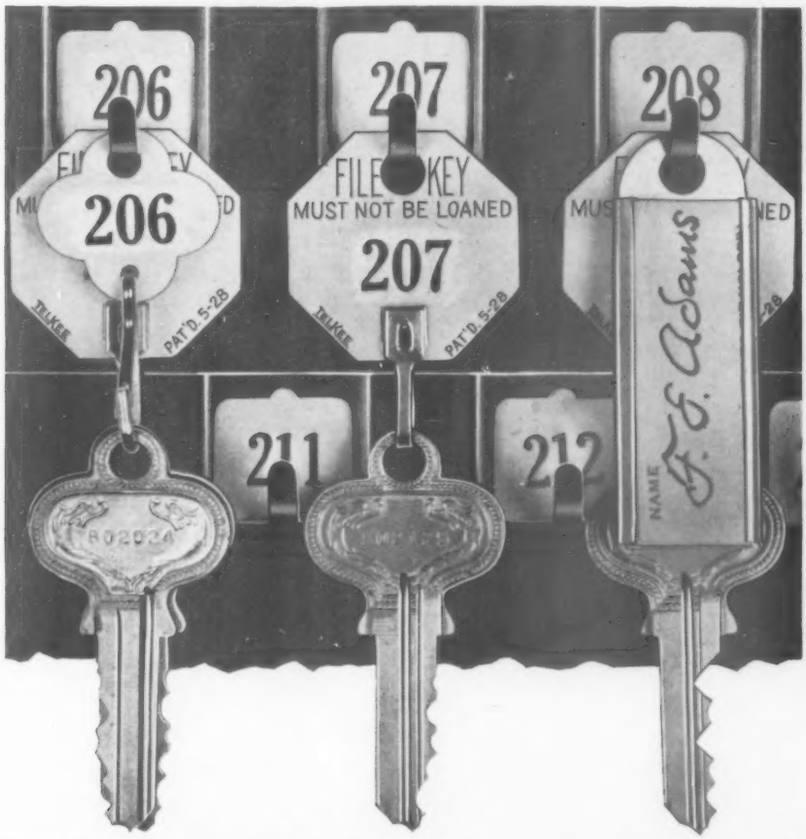
On account of the unsightly appearance and space wasting properties of the wall hanging type of key cabinet, maintenance and control of keys has usually been allocated to the engineer's quarters, or piecemeal to the various departments, with the result that no greater measure of control was exercised than dictated by the personal thought of the individual department head.

TelKee, to meet this objection to an executive key control, offers a variety of different types of stock cabinets manufactured on the lines of modern office equipment and in individual capacities from 50 to 1400 sets of keys. Fabricated in high grade furniture steel with baked on enamel finish, they harmonize with present day office files and cabinets and as many as 1000 sets of keys can be maintained in a space 18″ wide by 30″ high by 12″ deep. Except in the smaller capacities, these cabinets are made to stand on the floor in line with other files, or on stands, on tables, or on top of other files.

TelKee cabinets are a desirable but not an essential part of the TelKee System of Key Control. They are only a means to an end. Where satisfactory key cabinets are already in use in older buildings, they can frequently be serviced with TelKee accessories to furnish TelKee results, and always are available as supplemental cabinets in departments.

TELKEE IN OPERATION

FULL SIZE SECTION OF KEYBOARD,
SHOWING TYPICAL TELKEE SYSTEM ARRANGEMENT



HOOK 206—showing Reserve Pattern Key with permanent Marker attached, and two unissued duplicate keys with temporary Marker attached.

HOOK 207—showing Reserve Pattern Key. Duplicate keys have been issued with no receipt taken.

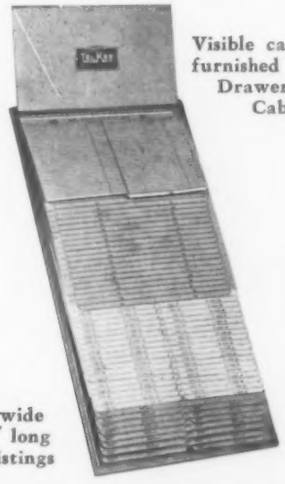
HOOK 208—showing Reserve Pattern Key, together with Receipt Holder carrying folded Receipt Record for the Duplicate Keys issued.

The Hook is of sufficient depth to accommodate, in addition to the "Reserve Pattern Key" as many as four duplicate keys.

CROSS INDEXES

Tumble Card

8½″ wide by 6″. Furnished in Units W.C. 150-250
320 listings



Visible card furnished with Drawer File Cabinet

8½″ wide by 25″ long
3040 listings

Book
Loose Leaf Ring

5″ wide by 9″ long. Furnished with Units P.S., H.T. and L.T.
2400 listings

Capacities Given Are Maximum Number Single Space Typewritten Listings Each for Alphabetical, Numerical and Lock Serial Indexing

TELKEE SYSTEM

Visibility

Since time immemorial, keys have been hung on hooks and modern methods have found no better way of handling them. This follows the modern business trend of maintaining visibly all business records that permit of it.

In order to save space, efforts have been made to file keys in envelopes or on cards in Card Drawer Cabinets. But experience has proven that keys cannot successfully be controlled in blind files. A key once misfiled in an envelope is lost for all practical purposes.

TelKee, to enhance visibility, increase efficiency and assist control, makes use of a small label pocket built in combination with, and behind and above the hook.

Into this is inserted a heavy paper printed label to identify that hook numerically with a room or locker number or a numerical cross index. It promotes easy filing—easy finding. To save space these combination hook-and-label pockets are spot welded to the TelKee panels in staggered rows so that keys hanging from one hook do not destroy the visibility of the labels and keys in the row below.

"Reserve-Pattern" Key Markers

The one greatest item in the expense of maintaining locks in accumulations great or small is caused by the loss, or unavailability, of all keys to a lock, or the possession of only badly fitted duplicates. This lack of keys with which to operate locks, in large installations, is the cause of the employment, on part or full time, of an expert or semi-expert locksmith to change or repair locks and fit and refit keys. In smaller installations it is the cause of endless confusion, annoyance, delay and the expense of new locks. This can be practically eliminated by making provision to always retain one original manufacturer's key to each lock; this key to be preserved as a "Reserve-Pattern" or Record key in the Master File. It should only be available as a "Reserve" key in case of an emergency and to be returned to the Master File immediately after use, or as a "Pattern" key from which all additional desired extra keys should be cut. Keys made from extra keys are a great source of trouble and expense as generally a key cut from an extra that in turn has been made from an extra will jam the lack. All extra keys should be either purchased direct from the Manufacturer or cut from an original key.

TelKee provides, to distinguish such keys, an octagonal heavy red fiber key marker **with a special brass clasp** which, once locked on a key, cannot be removed except by intentional destruction. It is octagonal in

shape and red in color to distinguish it from other markers and is die-stamped "File Key—Must Not Be Loaned." It should also be die-stamped and enameled with a numerical number to correspond with the number in the label pocket behind the hook. If it is missing or misfiled it is noticeable at once. **This key should be preserved throughout the life of the building and the lock.**

Duplicate Key Markers

Lock Manufacturers usually furnish 3 keys for each building door lock and 2 keys with lockers, desks, files, etc. Frequently owners have a need for more keys and have extra ones made. As we have seen, one of these originals is identified as a "Reserve-Pattern." The other keys, duplicate or extras, should be identified while in the cabinet to prevent misfiling.

TelKee furnishes for this purpose a Duplicate Key Marker. It has a type of clasp which permits the putting on or taking off of as many as three keys. It is

clover leaf in shape and made of white fiber to distinguish it from the Reserve-Pattern marker. It should be die-stamped and enameled with a numerical number to correspond with the number on the Reserve-Pattern key marker for that lock.

DRAWER FILE CABINET

A specially built Filing Cabinet in counter height to stand in line with standard office files or to be incorporated in counter equipment. If desired, a sanitary base brings it up to four drawer letter file height.

Manufactured in high grade furniture steel to conform with standard office equipment. Panel drawers operate on roller bearing progressive slide suspensions. Unit paracentric pilaster lock controls all drawers.

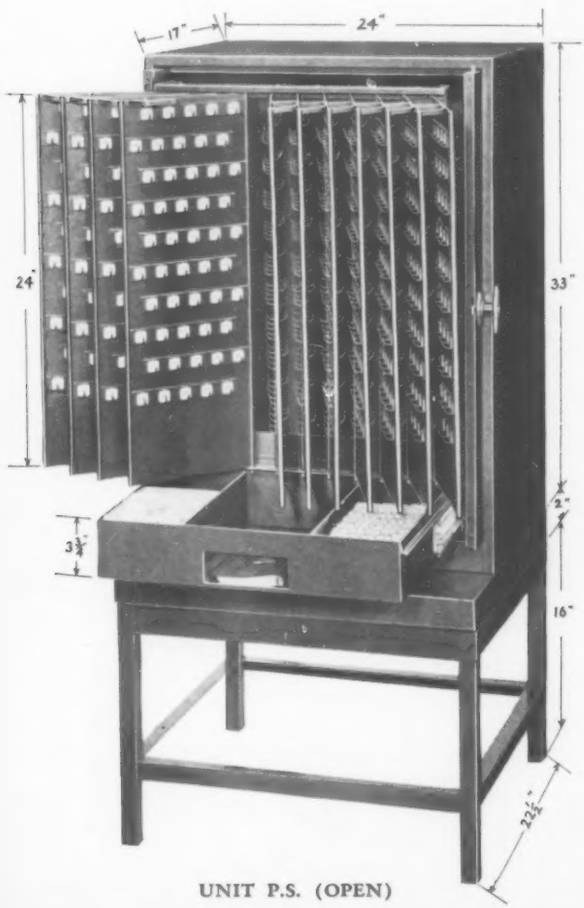
Panel drawers are equipped on the sides with a special device to hold panels firmly in a forty-five degree angle position to enhance visibility but permit them to be rocked forward on the bottom edges to a vertical position for convenient handling of keys. Device allows a flexible build up capacity from a minimum of 5 panels per drawer to a maximum of 12. Each panel (15¾" w. x 6¼" h.) is equipped with 2 staggered rows of 10 each combination hook-and-label pockets.

Index drawer has a visible card index panel with a maximum capacity of 96 5 x 8 tumble head cards furnishing 3040 single space typewritten listings each for alphabetical, numerical and lock serial indexing.

Standard finish baked on enamel Olive Green. Walnut or Mahogany, or finish to match sample submitted, furnished to order.

Capacity Sets of Keys	No. of Panels	Total Hooks	Outside Dimensions
600	30	600	18⅞ x 41 x 25¾
800	40	800	do
1000	50	1000	do
1200	60	1200	do
1440	72	1400	do

RECEDING DOOR CABINET
UNIT P.S.



UNIT P.S. (OPEN)

Designed for very active use where extreme visibility and accessibility is desired. Doors recede within the sides of the cabinet. With the opening of the doors the key panel carriage draws forward on progressive roller slide suspension to working position. Key panels swing in pin and socket bearings top and bottom. Spread of panels in full open position is 35 inches.

Each panel is equipped with 100 combination hook and label pockets (50 each side) except the end ones which are blank on the outside. Flexible build up capacity by panels from a minimum of six panels (500 capacity) to a maximum of nine 100 hook and two 50 hook panels (1000 capacity). In the panel carriage and below the panels are compartments for 3 x 5 cards, extra markers and the cross index book.

Regularly equipped with paracentric key in handle lock, blank or serially numbered hook labels and Cross Index Book.

Designed for use on counter or table. Cannot be fastened to wall. Special stands as shown in illustration can be furnished.

Standard Olive Green finish.

Walnut or Mahogany can be furnished to order.

Cat. No.	No. of Panels 100 Hks.	50 Hks.	Total Hooks	Outside Dimensions
PS422	4	2	500	24 x 33 x 17¼
PS522	5	2	600	do
PS622	6	2	700	do
PS722	7	2	800	do
PS822	8	2	900	do
PS922	9	2	1000	do
PS Stands for use with above cabinets.				24 1/16 x 15⅞ x 22 11/16

Receipts

When keys are issued to employees with no record kept of such issuance, no adequate control can be maintained and no responsibility placed for misuse. To guard the privacy and security afforded by locks it is necessary that the Management be able to ascertain positively at any time how many keys have been issued for any lock—to whom and when.

Many Institutions surround the issuance of keys with considerable formality and exercise great care that their keys do not come into the possession of unauthorized employees. Detailed card records with signature receipts are kept. For those who desire to keep their signature receipts in this card form **TelKee** furnishes card space in the larger capacity cabinets.

TelKee also offers a very simple and effective method for those who have no such receipt practice.

A brass Receipt Holder which can hang on the hook from which the key, or keys, were issued and which can contain a signed signature receipt form, fulfills most requirements. It has the added advantage of visibility, and frequent checks can be made visually to determine that receipts have or have not been obtained.

Cross Index (See illustrations, page 69)

While the practice of die-stamping the numbers of rooms and lockers on the keys themselves has been eliminated as destroying the fundamental purpose of privacy and security, it is still too generally the practice to show on the key markers, or tags, definite descriptions of the rooms or facilities to which keys belong. In all but the most closely controlled systems, keys with markers will be purloined or go astray and if definitely marked will defeat the purpose sought. To eliminate these hazards TelKee offers and urges the general use of a code index system for the indexing and cross indexing of keys. Code indexing is the giving, to the keys to a lock, of an arbitrary number which bears no relation to an actual room or locker number.

TelKee Indexes.
1. Numerically by arbitrary code number.
2. Alphabetically by description of facility.
3. Lock serially by manufacturer's die-stamped serial number on each lock and attendant keys.

The first permits one to find to what facility any key belongs; the second, the exact position in the cabinet of any desired key; the third, where in the cabinet and to what facility any returned, or lost-and-found, key belongs.

The Code Index is positive. There is no guesswork as to where a desired key is located in the cabinet—nor where a returned key belongs. If the usual filing clerk is ill or on vacation another designated operator can immediately pick up the work without confusion or delay. Code index use increases efficiency—easy filing and easy finding. Without access to the index no irresponsible finder or holder can use a key. When a Reserve-Pattern key is sent out to have additional desired extras cut, the maker has no knowledge of the facility to which the key belongs and it is useless to cut other keys for his own use.

Code indexing also facilitates operation as changes in room numbers or cylinders in locks or location of desks or files cause no corresponding changes in location of keys in the cabinet or changes in key markers. All changes are handled in the Index. An infinite number of changes, additions or subtractions can be made with no confusion or change in the original set up.

Full and detailed instructions on the simple procedure of making up the Index and setting up the TelKee System accompany each shipment.

Miscellaneous

It is desirable that active keys in supplementary cabinets in departments have markers of a different color or shape than the ones used in the Central Key Control. TelKee permanent locking type markers are therefore made in both red and white fiber, in brass, and in both octagonal and rectangular shape. Active keys in use in departments are thereby easily distinguished from the "Reserve Pattern" Key in Central Control.

There are also advantages in further visualizing the Central Key Control with different colors in the label pockets. For this purpose TelKee furnishes color guides in five colors in transparent celluloid which can be inserted in the label pockets in front of a number label. Building maintenance keys can be distinguished as red, locker keys as green, desk keys as blue, etc.

TelKee fits into any desired method of keeping and controlling keys, whether simple or involved.

Our services are at the disposal of Architects, Contractors or Managements for consultation or to make surveys of requirements and reports of findings and suggestions.

HIGH TABLE CABINET

Designed as a less expensive cabinet than the Unit P.S. but with all its features of extreme visibility and accessibility. Specially designed triangular shaped double doors that swing from rear hinges and include the sides of the cabinet. Doors, fully opened, spread 39".

As in the Unit P.S., panels swing on pin and socket bearings and are equipped with 100 combination hook and label pockets. Each side of the cabinet which swings with the doors is equipped inside with 50 hook and label pockets. Flexible build up capacity by panels from a minimum of four 100 hook panels (500 capacity) to a maximum of nine 100 hook panels (1000 capacity).

Regularly equipped with paracentric key in handle lock, blank or serially numbered labels and cross index book.

Designed for use on counter or table but is rigidly reinforced to be attached to wall if desired.

Finish—baked on enamel Olive Green. Walnut or Mahogany finish can be furnished to order.

UNIT H.T.

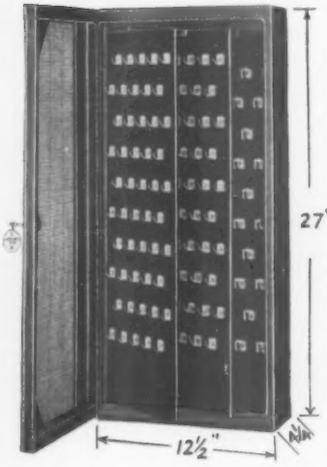
Cat. No.	No. of Panels 100 Hks.	50 Hks.	Total Hooks	Outside Dimensions
HT224	4	2	500	18 x 30½ x 12½
HT225	5	2	600	do
HT226	6	2	700	do
HT227	7	2	800	do
HT228	8	2	900	do
HT229	9	2	1000	do
HT Stand for use with above cabinets.				20 x 18 x 14½

LOW TABLE CABINET

UNIT L.T.

Exactly similar in design to the H.T. except in overall height. Panels have 50 hooks and label pockets (25 each side). Insides of doors have each 25 hook and label pockets. Flexible build up capacity by panels from 300 sets of keys to 500.

Cat. No.	No. of Panels 50 Hks.	25 Hks.	Total Hooks	Outside Dimensions
LT245	5	2	300	18 x 20¾ x 12½
LT246	6	2	350	do
LT247	7	2	400	do
LT248	8	2	450	do
LT249	9	2	500	do

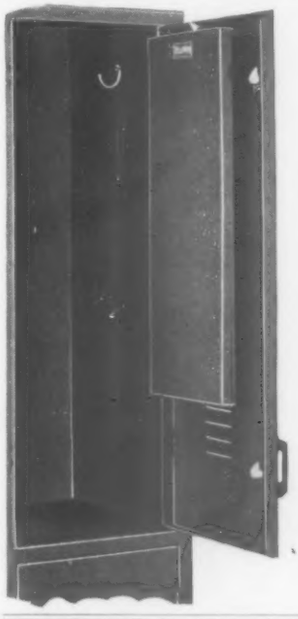


WALL CABINETS

UNIT W.C.

Fabricated in the same high grade furniture steel as larger cabinets. Fifty hook panel in the 75 capacity and one hundred hook panels in the 150 and 250 capacities. Paracentric key lock. 150 and 250 capacities are furnished with a tumble card cross index attached to inside of door. The 75 capacity has an alphabetical sheet index only. Includes labels for insertion in the label pockets. Finish standard Olive Green.

Cat. No.	No. of Panels	Total Hooks	Outside Dimensions
WC75	1 Swinging	75	10 x 15 x 3
WC150	1 "	150	12½ x 27 x 5
WC250	2 "	250	do



DOOR PANEL

Designed largely for use in smaller apartment houses or homes. Can be installed on the back of a closet door or in a locker. Standard 100 hook panel with latched cover and index sheet furnishes 100 hook capacity. Panel without hooks on outside and without cover furnishes 50 hook capacity.

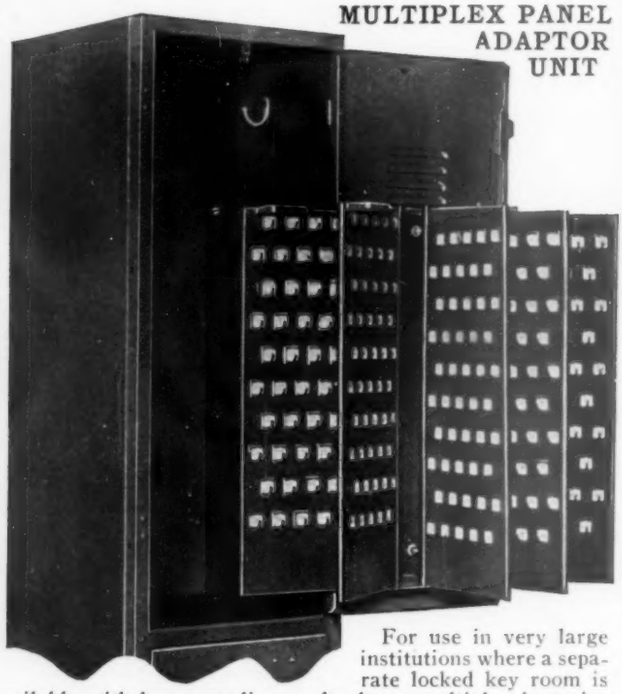
Cat. No.	No. of Panels	Total Hooks	Outside Dimensions
DP50	1	50	9½ x 24½ x 2⅝
DP100	1	100	do

DESK OR FILE DRAWER INSERT

For use in desk drawer to accommodate a maximum of 50 departmental or home keys. Can be placed in pairs back to back in a legal width card file cabinet where requirements are less than the minimum of 600 in the TelKee Drawer File cabinet. Five 10 hook panels in an open box with TelKee key-panel holder device.

No.	Total Hooks	Dimensions
50-D	50	15 x 11 x 3⅜

MULTIPLEX PANEL ADAPTOR UNIT



For use in very large institutions where a separate locked key room is available with key custodian or for large multiplex batteries of employees' or students' lockers.

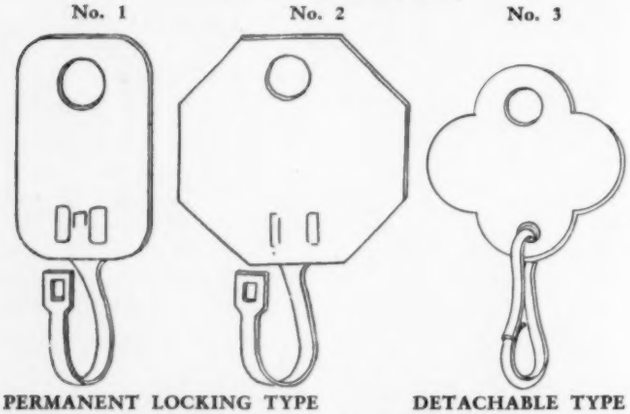
Standard 100 hook panels, 9" wide by 25" high, mounted on an adaptor socket bearing bar. Adaptor bars can be attached to back of locker doors or direct to key room wall.

Maximum visibility and accessibility—minimum space and cost.

Cat. No.	No. of Panels	Total Hooks	Dimensions
LA343	3	300	9 x 10 x 25
LA344	4	400	do
LA345	5	500	do

TELKEE ACCESSORIES

TELKEE MARKERS



PERMANENT LOCKING TYPE DETACHABLE TYPE

Above illustrations show actual size

By means of the patented clasp, No. 1 and No. 2 Markers lock to the key by pressure of the thumb, giving permanent identification. TelKee Markers are made both in white or red fiber and in brass. Fiber Markers may be inscribed with ink, indelible pencil or rubber stamp, or all markers can be die stamped and enameled.

Permanent Locking Type Markers should always be used to identify the Key File "Reserve Pattern Key." No. 2 Markers are furnished with die stamped legend "File Key—Must Not Be Loaned." Red fiber is preferable for pattern keys. The No. 3 detachable type Marker is for use on duplicate keys until issued as active. Durable tempered steel snap accommodates as many as three keys. Made in white fiber only.

TELKEE HOOKSTRIPS

For use in the reconditioning of present wood cabinets.

Furnished in strips of 5 and 10 combination hook and label pockets identical with combination used in TelKee cabinets except that strips are scored between combinations for easy separation by hand and are drilled for screw or tack attachment.

LABEL SHEETS

TelKee Hook Pocket Labels are made in high quality coated board, perforated in squares for easy detachment, and of exact size to fit label pockets.

Available in sheets of 100 perforated hook labels, unnumbered or serial numbering 1—5000.

RECEIPT HOLDERS

TelKee Receipt Holders, made of brass, are used to replace borrowed keys upon the Hook. Receptacle in Holder accommodates a key Receipt Form (described below) upon which is written all data pertaining to the key. In this manner every key, whether on or off the keyboard, is kept under complete control and quickly checked at all times.

RECEIPT FORMS

BORROWER'S FORM—Provides space for writing all pertinent data pertaining to borrower of key. Form is folded and inserted in Receipt Holder, which replaces key on its Hook, furnishing complete control information on borrowed key.

COLOR GUIDES

TelKee Color Guides, of transparent celluloid, for classification and signal purposes, fit the Label Pockets of all TelKee Filing Units. Readily applied to special classification work on keyboards. Furnished in five different colors.

BETHLEHEM STEEL COMPANY

General Offices: Bethlehem, Pa.

DISTRICT OFFICES

Albany	Bridgeport	Cleveland	Honolulu	Los Angeles	Pittsburgh	San Francisco	Syracuse
Atlanta	Buffalo	Dallas	Houston	Milwaukee	Portland, Ore.	St. Louis	Washington
Baltimore	Chicago	Detroit	Indianapolis	New York	Salt Lake City	St. Paul	Wilkes-Barre
Boston	Cincinnati	Hartford	Kansas City	Philadelphia	San Antonio	Seattle	York

EXPORT DISTRIBUTOR

Bethlehem Steel Export Corporation, New York

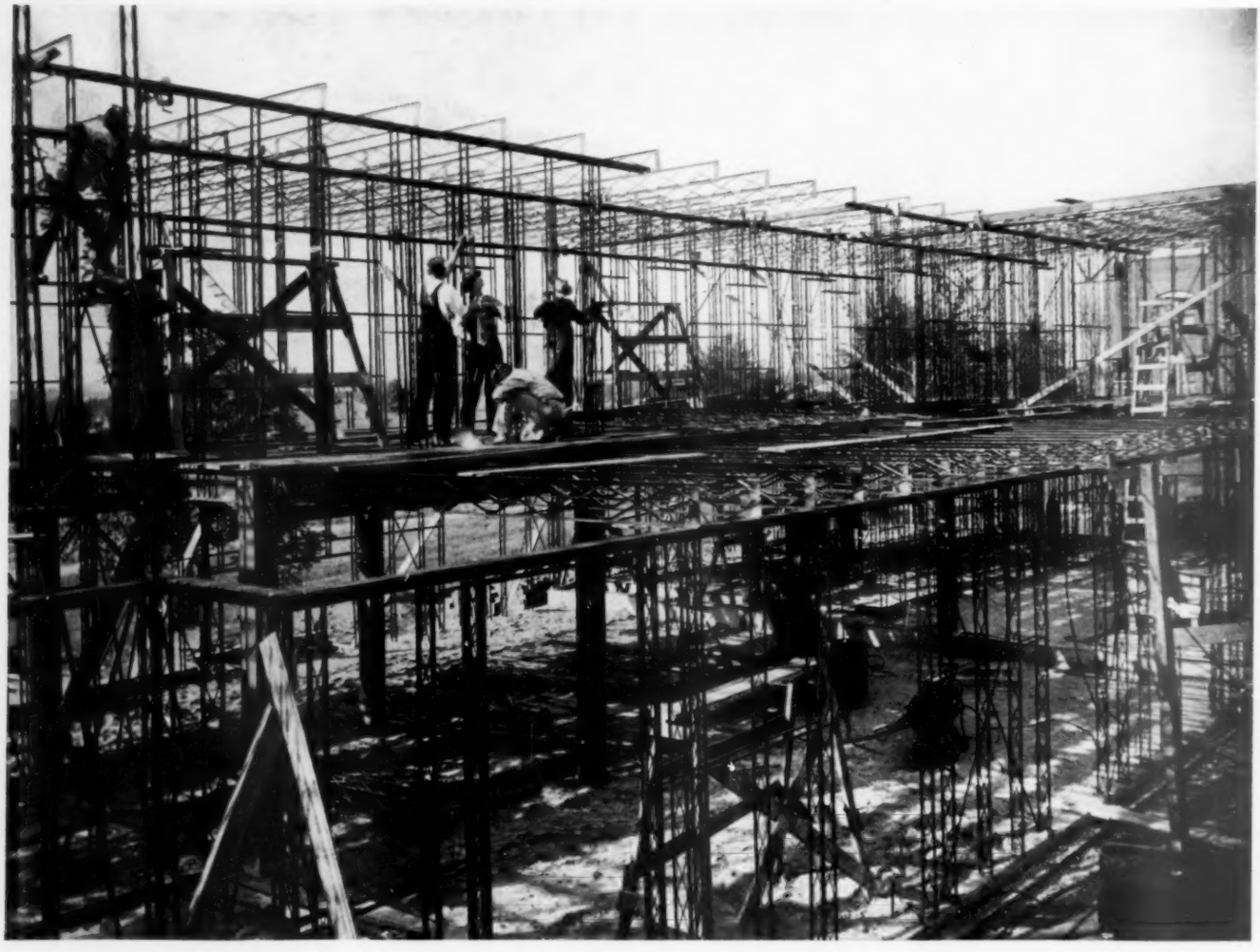
Washington High School, New York City

BETHLEHEM LIGHT STEEL MEMBERS FOR PERMANENTLY RIGID AND FIRE-SAFE SCHOOL CONSTRUCTION

BETHLEHEM Light Steel Members in building frames and floors make possible the fire-safe construction of all types of schools from a small, rural grade school to a large metropolitan high school without materially increasing the cost of the structure.

These Bethlehem Light Steel Members are available in a complete range of sizes and types. They include solid-web Joists and Stanchions, similar to regular heavy structural shapes but with thinner webs and flanges; and Bethlehem Joists and Studs having open or lattice-type webs, making them really light steel trusses. They may be bolted, riveted or welded into a complete steel frame for any light occupancy structure in accordance with conventional construction practice. They do not restrict the architectural design of the building.

In modern school buildings, Bethlehem Light Steel Members are particularly well-adapted to floor construction. Here they provide a rigid and secure floor framing to receive a concrete floor slab and an attached plaster ceiling on a metal lath base. Each floor



Steel Frame for University of Georgia Dormitory at Carrollton, Ga.
In 1936, five dormitories for the University of Georgia's branch schools at Americus, Athens, Carrollton, Dahlonega and Tifton were built with complete frames of Bethlehem Light Steel Members

thus becomes an impervious barrier that will localize any fire that may break out. This type of floor construction will resist fire for more than two hours in the usual ratings. Its application is not restricted to new structures. Old school buildings may also be economically remodelled and modernized with fire-safe light steel construction.

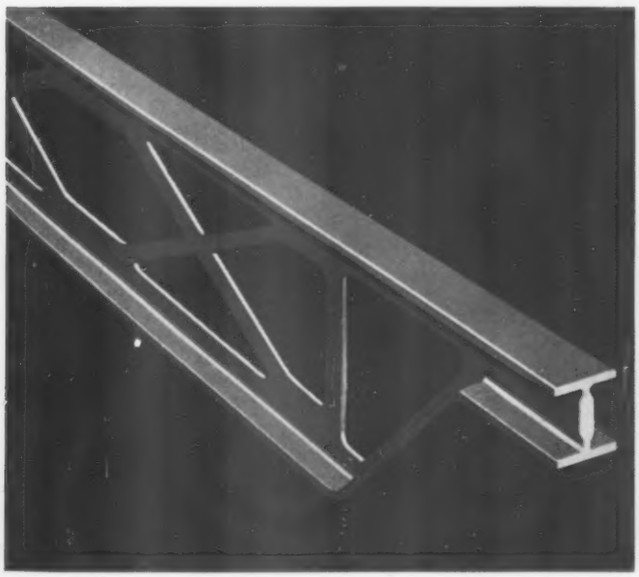
In addition to providing a high degree of fire-safety, Bethlehem Light Steel Members, either in floors or a complete steel frame, aid in making the building permanently tight-fitting and free from the unsightly, unhealthy cracks that invite vermin and serve as a breeding place for germs.

Floors built on joists of steel never settle, sag or become uneven and they do much to deaden sound. Impartial tests show that open-web steel joist floors with concrete floor slab and plaster ceiling are highly efficient as means of cutting off both air-borne and impact or tapping sounds. As a result, noises emanating from manual training rooms, gymnasiums and the movement of classes from one room to another have no disturbing effect on classrooms above and below.

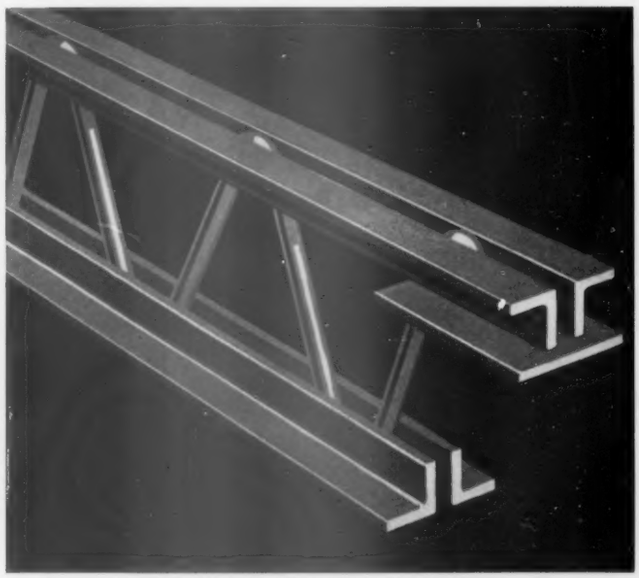
DETAILS OF BETHLEHEM LIGHT STEEL MEMBERS AND CONSTRUCTION

There are two distinct types of Bethlehem Open-Web or lattice-type Light Steel Joists: Kalman Joists—one-piece steel trusses made from special rolled sections by a hot slitting and rolling process, and MacMar Joists—steel trusses with standard angles in pairs for top and bottom chords and round rods for web members, assembled by high-pressure electric welding. Both types conform to the standards of the Steel Joist Institute.

Derry Township School, Derry Township, Penna.

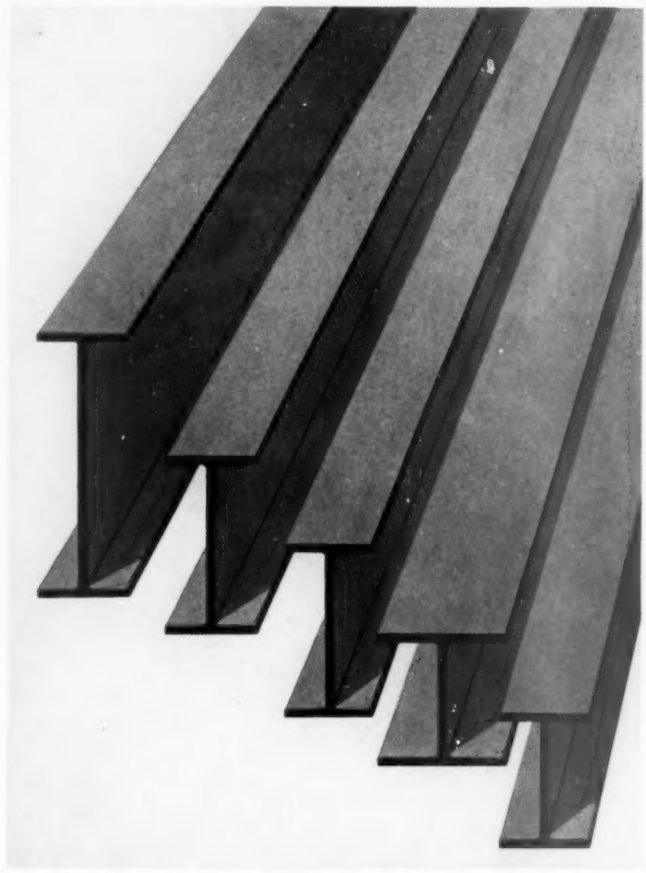


Kalman Type Open-Web Steel Joist
These one-piece, open-web steel joists are manufactured from special rolled sections by a hot slitting and rolling process

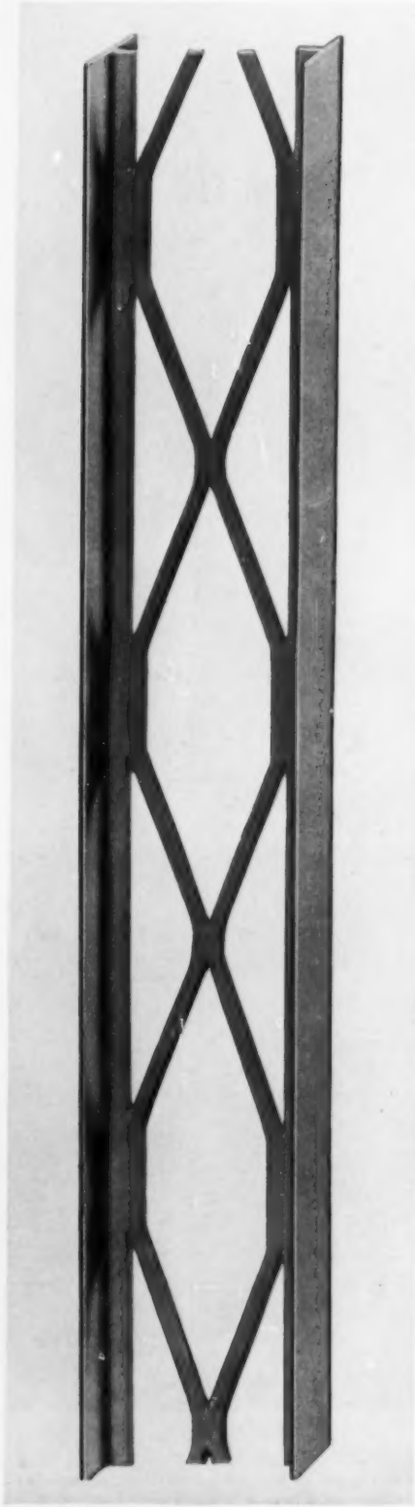


MacMar Type Open-Web Steel Joist
These steel trusses are fabricated of standard angles for the top and bottom chords and round rods for web members, assembled by high pressure electric welding

Bethlehem Solid-Web Joists and Stanchions are rolled from the same grade of steel and to essentially the same shapes as other heavier, wide-flange structural sections. Although they are light in weight for their depth, they are rolled with ample thickness of metal in flange and web to meet all building law requirements for light occupancy structures.



Bethlehem Light Section
Similar in design and appearance to the heavy structural shapes, Light Sections have ample thickness of metal to conform with all building law requirements



Bethlehem Open-Web Steel Stud
These upright members may be welded to the steel joists to form a complete steel frame for light occupancy structures

The construction of fire-safe floors with Bethlehem Light Steel Members is simple and can be quickly carried out. A section through a fire-safe floor built with Open-Web Steel Joists is illustrated herewith, showing the wire lath, wire lath clips, nailing strips and wood flooring laid over concrete slab. Either wood or any of the usual floor finishes may be used with this type of construction. The ceiling is formed by applying plaster direct to steel lath which is clipped to the bottom of the open-web steel joists.

Consultation with your architects regarding Bethlehem Light Steel Members in new construction and modernization work will prove interesting and valuable. Catalogs and literature describing in detail Bethlehem Open and Solid-Web Light Steel Members and accessories, giving dimensions, properties and safe-load tables may be secured on request from the nearest Bethlehem district office.

THE F. W. WAKEFIELD BRASS COMPANY

Yearwood Park, Vermilion, Ohio

Over 30 Years in the Manufacture of Lighting Equipment

DISTRIBUTORS IN 75 CITIES

FOR NEW SCHOOLS
AND OLD SCHOOLS

THE COMMODORE

New feather-weight lighting unit gives ample, glareless light for BETTER SEEING in schoolrooms

SCIENTIFICALLY designed to help young eyes develop normally, the Commodore gives good light without glare. And its amazingly light-weight shade, molded from Plaskon, brings to users of this new indirect lighting unit these advantages: 1. Less breakage; 2. increased safety; 3. easy cleaning; 4. low maintenance costs.

SEE WHAT A DIFFERENCE THE COMMODORE MAKES!

Here is a "before and after" story in one picture

This unretouched night photograph taken outdoors to show indoor lighting tells very dramatically how the Commodore improves seeing conditions in schoolrooms. The upper room was lighted with the former units; the lower, with Commodores.

GIVES MORE LIGHT . . . AND BETTER LIGHT

Hung from white ceilings, the Commodore is unusually efficient. It provides 83% of the light from the bare bulb, according to the report of Electrical Testing Laboratories . . . more light than most indirect fixtures. And it is more restful to eyesight because the light is diffused and the shade is low in brightness.

HELPS BOTH PUPILS AND TEACHERS

The light from this unit helps guard young eyes and older eyes from eyestrain. It makes rooms look bright and cheery. Thus it encourages cleanliness and other qualities of better citizenship.

Asbland, Obio, school room modernized with Commodores

SEE HOW IT MODERNIZES ROOMS

Relighted with the Commodore, this room became a different place to work. And the attractive white Plaskon shade and brushed aluminum shaft contribute greatly to this modernizing effect.

SEE THIS DEMONSTRATION *FREE*

See for yourself what a difference the Commodore makes . . . in your office or any other room. Takes only a jiffy and requires only a floor plug . . . thanks to an ingenious demonstration kit. **Or ask for free trial.** If you prefer, we will ship to responsible school officials one of the new Commodores, complete with bulb, on 90-day trial. You have no responsibility for breakage and no obligation to buy. Write us.

AMERICAN DISTRICT TELEGRAPH COMPANY

A.D.T. PROTECTION SYSTEMS
155 Sixth Avenue, New York City
CENTRAL STATION OFFICES IN ALL PRINCIPAL CITIES

Automatic Fire Detecting and Reporting Systems
Manual Fire Alarm and Signaling Systems

THE AMERICAN DISTRICT TELEGRAPH COMPANY, founded in 1873, is a nation-wide organization whose sole business is the manufacture, installation, maintenance and operation of electric protection systems. The A.D.T. fire protection systems described below are operated with Central Station Service, with Direct-to-Fire Department connection, or as Local Alarm Systems.

Central Station Service: The protection system at the subscriber's premises is electrically connected to the A.D.T. Central Station, where the alarm is immediately transmitted by direct wire to the fire department, and is also acted upon by A.D.T. emergency patrol forces. This service provides continuous electrical supervision, inspections and maintenance of the system by A.D.T. Available in more than 350 cities.

Direct-to-Fire Department Service: Where Central Station Service is not available, the system may be connected by direct, private wire to the local fire department, where suitable devices are installed for receiving alarms. Arrangements may be made with A.D.T. for periodic inspections, tests and other services.

Local Alarm Systems: Include equipment for giving the alarm locally by means of audible and visual signals. Provide for owner operation and maintenance, although when necessary, arrangements may be made with A.D.T. for periodic inspection, tests and other services. Available everywhere.

Mitchell School, one of eleven public schools in Charleston, South Carolina, protected by the Aero Automatic Fire Alarm System

AERO AUTOMATIC FIRE ALARM SYSTEM

This system, as its name implies, detects fire automatically, and (when such service is provided for, as explained above) automatically summons the fire department, as well as giving audible or visual warning signals on the premises. Aero is a combined pneumatic and electrical system which operates on the rate of temperature rise. The pneumatic part of the system consists of inconspicuous copper tubing, 1/12 in. diameter, run in loops or circuits along the ceiling or under the roof. Both ends of each tube circuit terminate in small metal chambers formed by expansible metal diaphragms of the aneroid barometer type. The rapid rise in temperature caused by a fire condition results in increased pressure within the tubing, which bulges the diaphragms, thereby making an electrical contact which results in an alarm. An annunciator shows the section of the building where the alarm originated.

Aero Detector Unit, with break-glass rod for manual operation. At right, Aero Annunciator

Fire protection engineers recognize this type of system—(operating on the **rate of temperature rise** rather than upon the attainment of any predetermined dangerously high temperature)—as assuring the fastest possible detection of fire.

While a complete Aero installation throughout a building is, of course, the ideal protection, this sometimes may not be feasible. In such cases, a partial installation covering only the areas of excessive hazard will often reduce the danger of serious fire to a point very close to the minimum.

The Aero system, by detecting the fire in its earliest stage, makes extinguishment possible with the minimum attendant damage. So speedy is the Aero system in detecting and reporting fire that a chemical hand extinguisher frequently suffices to extinguish the blaze.

Installation, Maintenance and Cost

No capital investment is required for the installation of an Aero system. The equipment is installed by A.D.T. engineers, and the service is rendered on a contract basis.

Installation of the equipment need not interfere with normal activities in the building. The inconspicuous tubing can be installed on the ceiling or walls in such a manner as not to mar the decorative scheme. The system is fully self restoring, i.e., no replacements of equipment are necessary after the system has operated.

The system can be tested whenever desired by introducing pressure into the tubing to simulate a fire condition.

Manual Fire Alarm boxes also are installed in association with the Aero System.

Write for descriptive booklet giving complete details.

SPRINKLER SUPERVISORY AND WATER-FLOW ALARM SERVICE

This service, for premises protected by automatic sprinkler systems:

(a) Makes the sprinkler system function as an automatic fire alarm, summoning the fire department automatically the instant a sprinkler head operates, or in case of a serious leak.

(b) Maintains a continuous, electrical watch over all vital parts of the sprinkler system. Any trouble condition which might impair the supply of water or its proper and effective distribution, is automatically detected and reported to the A.D.T. Central Station, which takes immediate corrective action.

Booklet describing A.D.T. Sprinkler Supervisory and Waterflow Alarm Service are available on request.

A.D.T. MANUAL FIRE ALARM AND SIGNALING SYSTEMS

Manual Fire Alarm Systems include the necessary equipment to enable the discoverer of a fire to give warnings locally and to summon assistance by manually operating a fire alarm box.

Manual Fire Alarm Systems are of two main types: coded and non-coded.

Coded Fire Alarm Systems—The coded system gives a distinctive signal on a system of bells or other signaling devices, indicating the location in the building of the box operated. When a number of buildings are to be protected, coded fire alarm systems can be furnished with **Group Control** to give an alarm at one or more points in all buildings.

Non-Coded Fire Alarm Systems—The non-coded system gives a continuous alarm on the bells or other signaling devices to warn the occupants of the building, but does not sound a code to indicate the location of the fire alarm box that has been operated.

Fire Alarm Box for Non-Coded Systems

Fire Alarm Boxes—For coded systems, boxes are furnished either with spring door or break-glass door, as illustrated. The alarm is sounded by pulling a lever inside the box. For non-coded systems, in most cases, boxes are of the break-glass door type, in which breaking a glass panel or rod results in the continuous ringing of the alarm bells. Fire alarm boxes are supplied for either flush or surface mounting.

Fire Alarm Box, Spring Door Type, for Coded Systems

Fire Alarm Box, with Break-Glass Door, for Coded Systems

Fire Alarm Bells—Single-stroke bells are used in most coded systems. The underdome type illustrated, includes a special hot pressed alloy steel gong with black rust-resisting finish. All mechanism is concealed under the bell shell. Vibrating bells are supplied for most non-coded systems. When desired, horns or other audible signals can be furnished.

Fire Alarm Bell, Vibrating Type, for Non-Coded Systems

Fire Alarm Bell, Single Stroke Type, for Coded Systems

Connection to A.D.T. Central Station and Fire Department—Where A.D.T. Central Station Service is available, A.D.T. fire alarm systems may be connected to an A.D.T. Central Station which summons the fire department directly to the location of the box operated. (For description of Central Station Service see opposite page.) Where Central Station Service is not available, connection may be made direct to the fire department.

Installation and Maintenance—The A.D.T. Manual Fire Alarm Systems described above may be purchased direct from the company or through electrical contractors. When A.D.T. Central Station Service is desired arrangements [illegible] made with a company representative who will call upon request.

Write for descriptive booklets giving complete details.

A.D.T. WATCHMAN'S COMPULSORY TOUR SYSTEM

For schools employing watchmen. Maintains constant check on watchman's performance and investigates immediately if watchman fails to signal the A.D.T. Central Station. Summons emergency aid in case of illness, accident or attack by intruders. This system may be installed in conjunction with A.D.T. Manual Fire Alarm Service.

A.D.T. Central Stations are located in all principal cities of the United States. They operate under the name "American District Telegraph Company," with the following exceptions: CHICAGO AND ELSEWHERE IN ILLINOIS, Illinois District Telegraph Co.; CINCINNATI, OHIO, Ohio Messenger & Telegraph Co.; DETROIT, MICHIGAN, The American Still Alarm; LOUISVILLE, KY., American Protection Co.; PHILADELPHIA, PA., Philadelphia Local Telegraph Company; CITIES IN THE STATE OF NEW JERSEY, American District Telegraph & Messenger Co.

ATHEY COMPANY

6034 West Sixty-Fifth St.
Chicago, Illinois

PERENNIAL WINDOW SHADES
CLOTH-LINED METAL WEATHERSTRIPS
ATHEY SEALTITE CAULKING COMPOUNDS

Athey Products

ATHEY DISAPPEARING SKYLIGHT SHADE
ATHEY VENETIAN BLINDS

Information and prices gladly given on request

ATHEY PERENNIAL WINDOW SHADES

Athey Perennial Window Shades are ideal for use in school and college buildings of all kinds, for, being translucent, the shades with the sun on them throw a soft light over the room, giving sunlight without glare, and conserving the eyesight of the pupils.

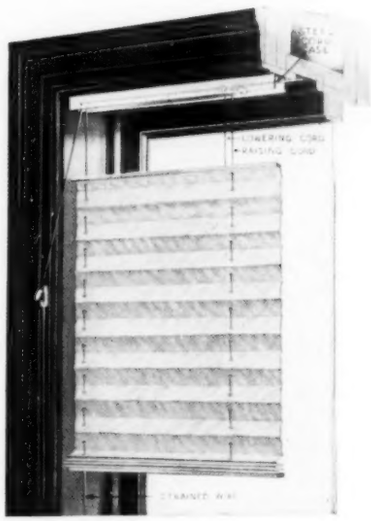
Being instantly adjustable to cover any part of the window necessary, they permit the windows being opened at both top and bottom, insuring better room ventilation, and, operating on bronze guide wires, flapping of shades when window is open is eliminated.

Made of the strongest and most durable material ever used for shades, they last longer than other shades, so on a cost per year basis are the most economical shade obtainable.

They are exceptionally attractive with their cockle finish and pleats, coming in a choice of several colors, and in widths up to seventeen feet.

The black opaque shades are useful for darkening assembly rooms and classrooms for motion picture projection.

School Lunchroom Equipped With Athey Shades



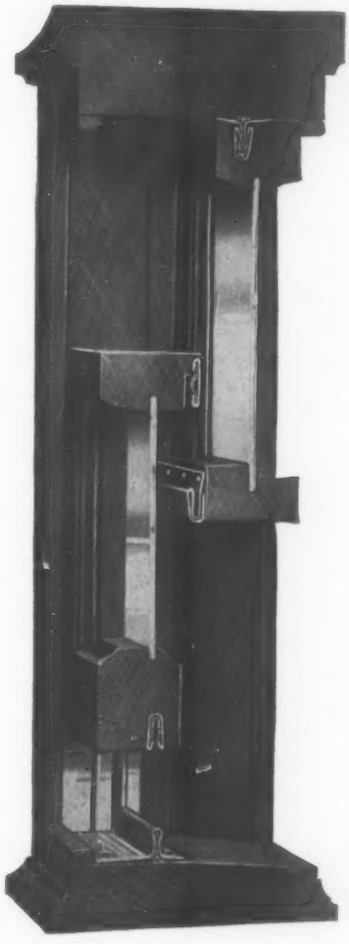
Schools, colleges and auditoriums find Athey Shades ideal for skylights, too — the translucent shades for protecting against glare and heat, and the black shades for darkening rooms for motion pictures.

Write for catalog.

A Few of the Hundreds of Prominent Schools and Colleges Using Athey Shades

Woodrow Wilson High School, Los Angeles, Calif.
St. Francis Academy, Joliet, Ill.
Saginaw High School, Saginaw, Mich.
State Normal College, Cortland, N. Y.
The Choate School, Wallingford, Conn.
Bisbee Public School, Bisbee, Ariz.
University of South Carolina, Columbia, S. C.
Arlington School, Spokane, Wash.
University of Hawaii, Honolulu, T. H.

ATHEY WEATHERSTRIPS



Athey Cloth-Lined Metal Weatherstrips have important advantages over ordinary metal weatherstrip:

First: Their cloth-to-metal contact eliminates all air leakage—and drafts and dust are effectually kept out as well.

Second: Makes an easily operated window; no rattle of sash. Saving in fuel consumption will pay for the cost of an installation in from two to three seasons, with a like saving in ash removal cost, cleaning of drapes, walls, etc., due to the exclusion of dirt as well as cold air.

With any type of heating plant or air-conditioning system in your school buildings, loose doors and windows cost money for extra fuel, and the drafts are a source of discomfort and a menace to health. **Save** this money, **avoid** this discomfort, and **eliminate** this menace to health, by installing Athey Weatherstrips in your school buildings.

A Few of the Many Schools and Colleges Using Athey Weatherstrips:

Streator High School, Streator, Ill.
Western Reserve Academy, Hudson, Ohio
Purdue University, Lafayette, Ind.
Cattaraugus School, Cattaraugus, N. Y.
Johns Hopkins University, Baltimore, Md.
Wesleyan University, Middletown, Conn.
Woodlawn High School, Birmingham, Ala.
Lincoln School, Great Falls, Mont.

These and many other schools find Athey Weatherstripping most economical because:

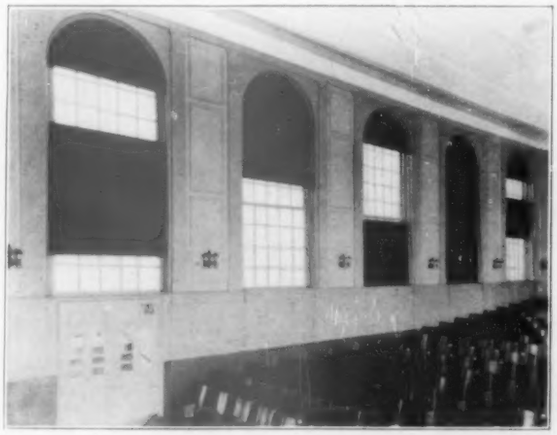
1. It is most highly efficient.
2. It maintains its maximum efficiency throughout the life of the building, never needing repair or replacement.

SEALTITE CAULKING

Knife or gun grade. Permanently elastic, impervious to heat or cold, adheres to wood, stone or metal, stainless. Standard colors white and gray, special colors to order. Approved by U. S. Bureau of Standards for government use.

Write for catalog

National Kindergarten, Evanston, Ill.



Black Shades in Use in Lexington High School, Lexington, Mass.

THE CELOTEX CORPORATION

919 N. Michigan Avenue
Chicago, Illinois

SOLE DISTRIBUTORS OF

THERMAX
REG. U. S. PAT. OFF.
A STRUCTURAL INSULATING PRODUCT BY
CELOTEX
REG. U. S. PAT. OFF.

ABSORBEX
TRADE MARK
AN ACOUSTICAL PRODUCT BY
CELOTEX
REG. U. S. PAT. OFF.

PRODUCTS

Thermax Fireproofing Insulation, partition blocks, furring and roof slabs.

Absorbex Acoustical Corrective.

THERMAX PARTITIONS

Thermax Partitions are fire resistant, highly soundproof and earthquake proof. They are light in weight, economically erected, and offer a true surface and excellent bonding key for plaster or stucco.

Thermax is also used in connection with reinforced concrete floor construction forming; sound-deadening plaster base, and for suspended ceiling construction and sound insulation of ducts in air-conditioning systems.

Sizes
1" x 20" x 64"
2" x 20" x 64"
3" x 20" x 64"
or 32"

Weight
Approx. 2.2 lbs. per sq. ft. per inch thickness

Thermal Insulation Value
.46 B.t.u. per inch

ABSORBEX ACOUSTICAL CORRECTIVE

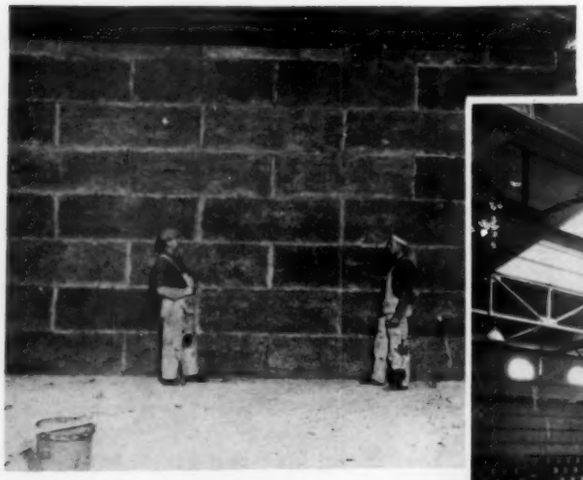
Absorbex is non-inflammable, and can be repainted many times without affecting its sound absorbing qualities—is permanent and decorative.

Absorbex has been tested by the official laboratories of the Acoustical Materials Association, and is listed in the Association literature as having high absorption coefficients.

Absorbex is particularly adaptable to auditoriums, gymnasiums, cafeterias, offices, corridors and classrooms. It is installed by approved contractors skilled in the technique of application and with thorough knowledge of the engineering principles as applied to architectural acoustics and sound insulation.

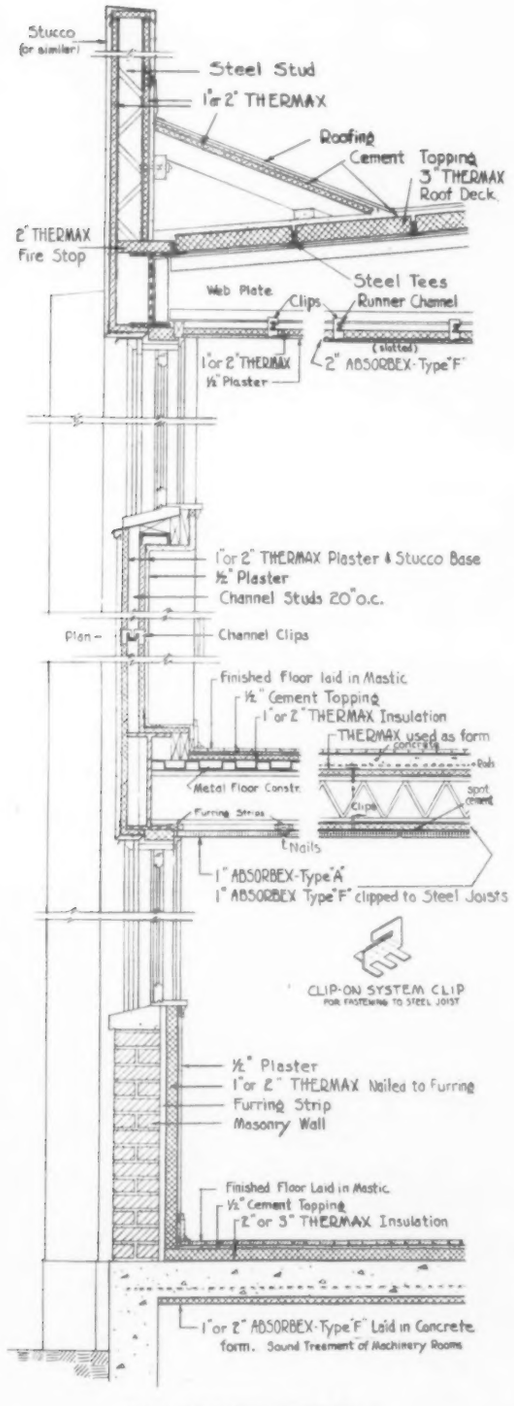
See Sweet's Architectural Catalog or write—

THE CELOTEX CORPORATION
919 N. Michigan Avenue
CHICAGO, ILL.



Thermax Partitions
Fire and Earthquake Resistant

Absorbex Acoustical Corrective
Incombustible and Permanent



COMPOSITE DETAIL
ILLUSTRATING TYPICAL USES OF THERMAX FIREPROOFING INSULATION AND ABSORBEX ACOUSTICAL CORRECTIVE FOR
SCHOOL CONSTRUCTION

THERMAX

FIREPROOFING—Fulfills requirements of Board of Fire Underwriters and Building Codes.

EARTHQUAKEPROOF — Thermax absorbs the shock without affecting plaster or stucco facing.

LIGHTWEIGHT—Thermax minimizes the combined weight of adaptable construction.

UNIFORMITY—Rigid factory supervision assures a uniform product.

REASONABLE COST—Fire resistance, structural characteristics and insulation efficiency, combined in one material, make the comparative cost of Thermax low.

EASE OF ERECTION—Thermax is easily and rapidly erected.

EXPANSION AND CONTRACTION—Installations show no defects due to expansion or contraction under various climatic conditions.

VERMIN PROOF—Fire resisting cement binder is unattractive to vermin-termite.

FUNGI PROOF—Shows unusual resistance to the attack of fungus or dry rot.

MOISTURE RESISTANCE—Non-capillary.

THERMAL CONDUCTIVITY—.46 B.t.u. per hr., per sq. ft., per degree F., per inch thickness.

SOUND INSULATION—Thermax is recommended for sound-deadened partitions and sound isolation for machinery rooms, and sound filters and baffles in air conditioning systems.

STRUCTURAL STRENGTH — Thermax satisfies Building Code requirements for insulated load-bearing roof decks and floors, fire-resisting, non-bearing partitions, sheathing and plaster and stucco base.

ABSORBEX

INCOMBUSTIBLE TILE FORM

SOUND ABSORPTION efficiency range up to .98

TYPES and SIZES provide full range of sound control

INERT to temperature and humidity changes

STRUCTURAL STRENGTH

HIGH LIGHT REFLECTION

LOW COST per unit of absorption

ADAPTABLE to any architectural design

TEXTURE interesting and non-mechanical

STERILE

LOW MAINTENANCE COST

REDECORATED with lead and oil paint without loss of efficiency.

CONGOLEUM-NAIRN INC.

General Office: Kearny, New Jersey

SEALEX
Trademark Registered
LINOLEUM FLOORS and WALL-COVERING

Thousands of schools, including many of America's best known colleges and universities, have installed Sealex Linoleum Floors. As manufactured by Congoleum-Nairn, world's largest producer of smooth-surface floor-covering, Sealex Linoleum possesses certain unique advantages that make it a first choice in the school field.

Sealex Linoleum is resilient; therefore quiet and comfortable underfoot.

It is also a highly sanitary and easy-to-clean flooring. For its smooth surface contains no dirt-catching and dust-generating cracks or joints.

Furthermore, Sealex Linoleum is built to withstand many years of wear without expensive refinishing. To these qualities is due the steadily increasing popularity of Sealex for school floors.

There are Sealex Floors appropriate for every type of school interior. And any floor design, ranging from colorful insets for younger pupils' classrooms to classic or school emblems fitting for the finest university, may be cut to order at moderate cost in Sealex Linoleum.

Sealex Veltone Linoleum, one of the most popular resilient floorings, serves as a background for nursery rhyme characters and letters of the alphabet in this designed-to-order kindergarten floor. Colorful Sealex Floors afford a practical means of making younger pupils' classrooms cheerful and attractive

Concentration on studies is aided by this resilient, noise-subduing floor of Sealex Treadlite Tile in the library of the Topeka, Kansas, High School

Without seams or joints in its smooth surface, this floor of Sealex Battleship Linoleum assures the cleanliness and freedom from dust necessary in school areas

Another material highly recommended for school use is the linoleum-type Sealex Wall-Covering. It offers a wide variety of colorings, is washable and sanitary, and never has to be renewed.

Sealex Floors and Walls are equally suitable for remodeling or for completing new school interiors. When installed by authorized contractors located in principal cities, both materials and workmanship are backed by Guaranty Bonds.

SCHOOL SUPERINTENDENTS — Write for our newest "Resilient Floors" catalog. This complete up-to-date catalog of information about floors of the linoleum or cork composition type will be sent without charge to you.

●

CONGOLEUM-NAIRN INC.

KEARNY, NEW JERSEY

THE AMERICAN SCHOOL AND UNIVERSITY

The ideal gymnasium floor—splinter-proof, germ-free Sealex Linoleum with inlaid game markers. West Milwaukee High School, Wis.

HOLCOMB & HOKE MFG. CO.

Established 1896

1545 Van Buren St., Indianapolis, Ind.

PRODUCT: THE FIRE TENDER

WHAT IT IS

The FIRETENDER is a highly efficient automatic coal stoker.

WHAT IT DOES

(1) Reduces heating costs 15 to 50%.
(2) Provides even, dependable heat, regardless of outside weather conditions.
(3) Keeps up attendance records.
(4) Eliminates smoke nuisance.
(5) Releases janitor for other duties.

HOW IT ACCOMPLISHES THESE THINGS

Reduces Heating Costs

(1) The FIRETENDER reduces heating costs because it enables you to burn your locally-mined, low-priced coal cleanly and efficiently, and **burns fewer tons per month** than required by hand-firing, at the same time giving you **better and more uniform heating.**

Even Heat

(2) The automatic controls on the FIRETENDER are so simple, yet so accurate and reliable, that any desired temperature may be established and **maintained indefinitely**—regardless of sudden drops in temperature outside.

Attendance Records

(3) When classrooms are kept evenly heated, students enjoy better health—consequently there are fewer absences due to the ailments caused by fluctuating temperatures.

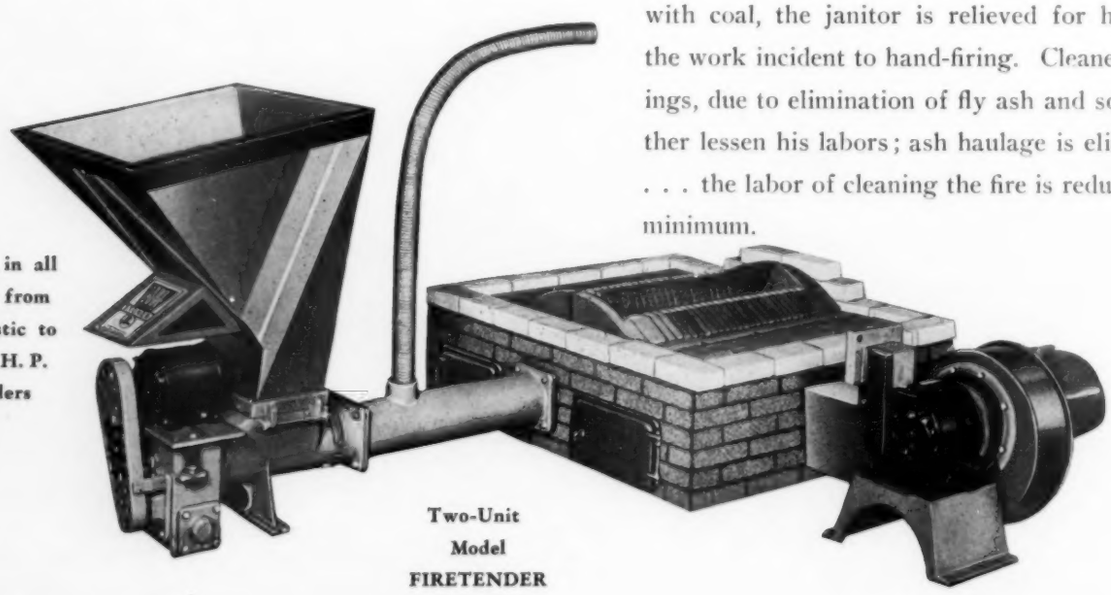
Smoke Prevention

(4) Smoke is **unburned fuel.** The FIRETENDER **burns all the fuel gases** because it fires coal in the only scientifically correct manner—**from underneath.** Feeding from below, up through the long, deep retort, the coal, as it is heated, gives off combustible gases which are mixed in correct proportions with air from the fan and also up through the white-hot fire, where they burn and produce the maximum heat.

Releases Janitor

(5) Once the FIRETENDER hopper is filled with coal, the janitor is relieved for hours of the work incident to hand-firing. Cleaner buildings, due to elimination of fly ash and soot, further lessen his labors; ash haulage is eliminated . . . the labor of cleaning the fire is reduced to a minimum.

Made in all sizes from domestic to 150 H. P. Boilers



Two-Unit Model FIRETENDER

FIRE TENDER

"School of Experience"

During the eight years in which the FIRETENDER has been demonstrating its fine efficiency, economy and convenience, many school officials have expressed their approval in letters such as these (Names and locations upon request):

Fuel Saving

"In going through one of the coldest winters on record, we find our coal bill less than any other time since we have been in the new building."

"The FireTender installation amounted to about $5500 for the three schools, and our annual saving . . . is between $3500 and $4000."

"The FireTender has made a saving of 80% in fuel cost alone."

"During the past year these FireTenders have reduced our fuel cost more than 50%."

". . . By hand firing we had on many occasions, when the weather was around zero, run 15 tons of coal per day through these three boilers, but since the stokers were installed we have never used more than 9 tons per day and have had a much more even heat."

"As to the coal consumption we have made a real saving, both in tonnage and price."

"With your stoker in operation the saving conservatively estimated is shown by the following comparison:

195 tons Anthracite—$7.50 per ton....	$1462.50
165 tons Bituminous—$5.00 per ton....	$ 825.00
Net saving at least	$ 637.50 per year."

Labor Saving

"Formerly the engineer was running back and forth, trying to keep this school warm (as we have two buildings that he has to look after). Now he can forget this building, as all he has to do is fill the hopper and take out the clinker once a day in the coldest weather."

"These FireTenders have greatly facilitated the handling of the boiler room. We can raise 60 pounds of steam within 45 minutes after the fire has started . . . and with the poorest grade of coal we have used it has taken only 75 minutes . . . both times far under anything we could do by hand firing."

Healthfulness

"The average attendance has increased since the installation of the FireTender, with less sickness because of even temperature."

Cleanliness

"The FireTender . . . has eliminated the smoke nuisance from the neighborhood."

"Considerable opposition to the use of soft coal was encountered, prior to the installation of the FireTenders, but we have had no smoke, nor any more dust and dirt than we had with **hard coal."**

"The FireTender is efficient to a remarkable extent. It is so equipped with fuel and air adjustment that when we adjust it to our satisfaction we have **complete smoke consumption** and nothing is left in the clinker but fused material."

Comfort

"The FireTender gives an evener temperature to the rooms than can be accomplished with hand stoking."

"In previous years it was impossible to maintain an even temperature in the three buildings which we heat, but in spite of the severe weather this winter we have had no difficulty in keeping every room comfortably warm at all times."

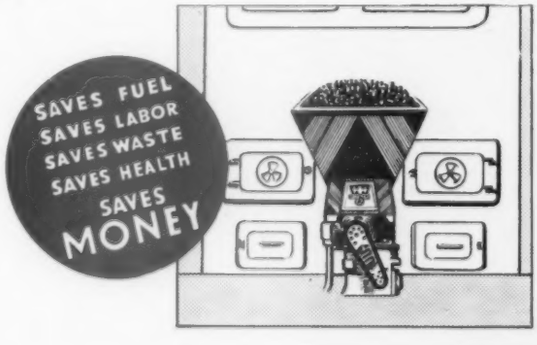
"With 18° below zero, there was plenty of heat and no room in the building had a variable of more than three degrees."

Service Requirements

"So far, in three seasons, we have had no expense for repairs . . . and no repairs will be necessary to start next season's use."

"Thank you for advising us that you are prepared to service the FireTender. I am happy to say that after four years it is still giving satisfactory service."

"Since the installation of the FireTenders in the fall of 1932 they have given complete satisfaction in every way, both from the standpoint of service as well as wear."



THE JENNISON-WRIGHT COMPANY

Toledo, Ohio

BRANCHES IN ALL LARGE CITIES

Kreolite Separate Wood Block Floors serve in the school and educational institution no less than in the factory and work shop where today their use is so general as to reveal Kreolite as the national choice for heavy-duty service.

Especially is Kreolite specified for all departments where mechanical operations are carried on. Tools are not damaged when they are dropped, for the Kreolite floor is resilient. The floor is not damaged because wear and accident leave no appreciable impression upon the tough end grain surface of the specially treated selected wood blocks.

Among the scores of leading educational institutions now enjoying the economy and benefit of Kreolite Wood Block Floors are: Cleveland High School, Cleveland, Ohio; Jefferson High School, Los Angeles, Calif.; Lindbloom High School, Chicago, Ill.; University of Michigan, Ann Arbor, Mich.; Purdue University, Lafayette, Ind.; Technical School, Indianapolis, Ind.; University of Illinois, Urbana, Ill.; University of Wisconsin, Madison, Wisc.; Yale University, New Haven, Conn.

Write for complete information

KREOLITE

WOOD BLOCK FLOORING

Kreolite Wood Block Floors Used in Over 135 Schools!

Kreolite Flexible Strip End Grain Wood Block Floor in the Gymnasium of the New York State Vocational Institution, West Coxsackie, New York

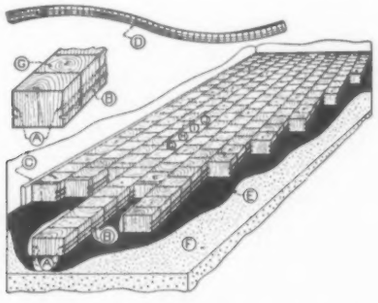
One of the many Kreolite gymnasium floors giving maximum of resilience, safety, appearance, wear, non-slipping, and all around satisfaction as to its ability to successfully withstand gymnasium play of all kinds.

The value of Kreolite Flexible Strip End Grain Wood Block Flooring is recognized instantly by the modern architect of schools and public buildings. They cannot become loose in the floor. The durability is practically limitless as the strips are laid with the tough end-grain of the individual blocks uppermost. The light natural color and beauty of the wood are retained, although the blocks are treated with a transparent, waterproof preservative.

Complete Information Sent on Request

(a)—Metal wire truss binding the individual blocks into a compact, solid monolithic-like end-grain plank or strip.

(b)—Metal spline binding the individual strips together.



(c)—Cork expansion joint laid flush with the surface of the floor.

(d)—Flexibility—can be laid over wood sub-floor, in mill type buildings.

(e)—Waterproof membrane between concrete and strips.

(f)—Smooth finish concrete foundation.

(g)—Surface sanded smooth.

(h)—Manufactured from properly dried yellow pine or redwood.

(i)—Treated with a transparent, odorless, waterproofing preservative so that the natural light color of the wood is maintained. The surface of the floor may be waxed and highly polished if desired, presenting a most pleasing and beautiful design.

(j)—Laid with the tough end-grain up. End-grain blocks run full depth of strips, from top to bottom, each block being anchored to the base, in a bed of mastic.

Kreolite Wood Block Floors Used in Over 135 Schools!

JOHNS-MANVILLE

22 East 40th Street, New York, N. Y.

OFFICES IN ALL LARGE CITIES

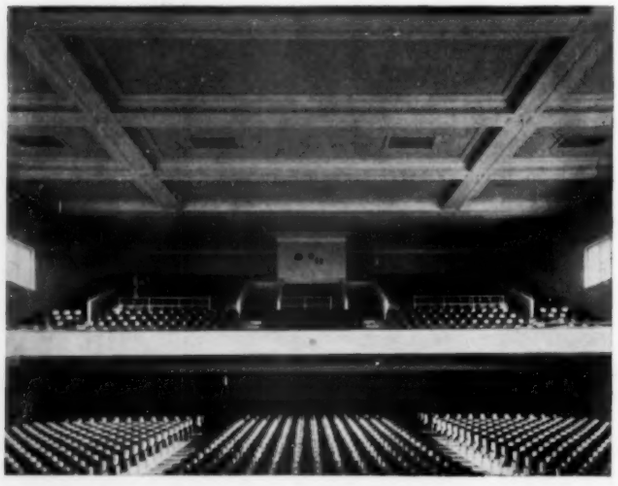
J-M SOUND CONTROL

Sound control is an essential requirement in the modern school or university. Disturbing, nerve-wracking noises—from busy corridors, gymnasiums, swimming pools, cafeterias, kitchens—are no longer a necessary evil. And auditoriums and lecture rooms can be so treated that a speaker's voice can be heard clearly and distinctly in any part of the hall. Johns-Manville offers acoustical treatment and sound control materials for every type of noise problem.

J-M Sanacoustic Tile

J-M Sanacoustic Tile, which has the widest adaptability and is about the most nearly universal sound control material, absorbs 85% of noise. It consists of a perforated sheet metal tile, which serves as a container for a special rock wool pad, the sound absorbing medium.

Fireproof—Easily Maintained: The triple-baked enamel finish of Sanacoustic Tile presents a sanitary, light-reflecting surface that is easily washed and which can be frequently repainted without in any way affecting its efficiency as a noise-quieting material; hence, maintenance is reduced to a minimum. And—a vitally important consideration—J-M Sanacoustic Tile is one of the few acoustical materials that is completely fire-safe. Furthermore, it is inherently permanent, since rock wool is a mineral product, completely immune to rot or decay.



J-M Sanacoustic Tile Applied in the Auditorium of the Clinton Kelly High School, Portland, Oregon

For use in damp or humid places, such as kitchens and swimming pools, the perforated tile and accessories are fabricated of corrosion-resistant metal.

Sanacoustic Tile Can Be Easily Washed; Frequently Repainted

100% Salvageable: Sanacoustic Tile can be quickly and readily applied, and the ease with which the tile units can be removed makes possible the complete salvage of an installation in case of alteration, and facilitates the making of any desired change in lighting outlets.

Neat, Attractive Appearance: J-M Sanacoustic Tile, and other Johns-Manville sound-absorbing materials for application on wall or ceiling, are neat and attractive in appearance, and are available in numerous finishes that offer practically limitless decorative possibilities.

Where Schools Need Sound Control Treatment

For the benefit of students and faculty alike, sound control treatment should be used for the quieting of corridors, classrooms, libraries, gymnasiums, swimming pools, cafeterias and lunchrooms, and executive offices. Acoustical treatment is also needed to assure correct hearing conditions in auditoriums, chapels, assembly rooms and lecture halls.

J-M Sound Isolation

Johns-Manville acoustical service also includes the isolation of undesirable vibrations coming from machinery in various parts of the school, which thus permits the installation of mechanical equipment at advantageous locations without causing disturbance in other parts of the building.

Write for New Brochure

You will be interested in the new Johns-Manville brochure, "Methods of Sound Control for Schools and Universities," AC-16A. It describes the characteristics and uses of all J-M Sound Control Materials, and tells how you may obtain the services of Johns-Manville Acoustical Engineers, without any obligation on your part. The booklet is free on request.

J-M ASPHALT TILE FLOORING

Johns-Manville Asphalt Tile, Type A, a resilient, quiet and attractive flooring material, is ideally suited for use in the modern school or university. This material provides a permanently smooth and durable surface, in many possible color combinations in either plain or marbleized design.

Quiet—Fire-Resistant—Easily Maintained: The resiliency of this flooring material cushions heels, makes for quiet foot traffic and comfort underfoot. Being fire-resistant, J-M Asphalt Tile Flooring has been officially approved for fireproof buildings in many cities. Barring exceptional abuse, it requires no attention or expense for maintenance beyond ordinary cleaning. It is odorless, waterproof and does not originate dust.

J-M Heavy Duty Asphalt Tile

J-M Heavy Duty Asphalt Tile was designed especially for severe service such as that encountered in school corridors, halls, lobbies, etc. Provided in four attractive solid colors—red, mahogany, brown and black—and in several marbleized designs, it is outstanding for its resistance to indentation, its great strength and its ability to withstand exposure to moisture. It may be installed below grade where damp conditions prevail, and can also be applied directly to smooth wood sub-floors without the usual leveling course.

Details on Request

J-M Asphalt Tile Flooring costs no more than other resilient floorings, and in many cases the price is considerably less. The illustrated J-M Tile Flooring Brochure describes Decorative and Heavy Duty Asphalt Tile. Color charts showing the attractive color combinations and designs are also available. Send for Brochure FL-17 on Asphalt Tile Flooring, and ask for the color charts, sent free on request.

J-M Heavy Duty Tile is unexcelled for service in school corridors

J-M BONDED BUILT-UP ROOFS

Johns-Manville Bonded Asbestos Built-up Roofs answer all requirements for a school roof. They are light-weight, durable, weatherproof—and, a most essential consideration, fireproof. Built-up of alternate

J-M Built-up Roofs are permanent, weatherproof, fire-resistant

layers of asphalt-saturated asbestos felt and roofing asphalt, they cannot burn—thus giving assurance of permanent protection.

Easily Maintained: Asbestos, being imperishable and rot-proof, provides the best assurance of long roof service. Because asbestos fibres are non-capillary, J-M Asbestos felts form a positive barrier against evaporation of the waterproofing asphalts; they are virtually immune to the intense drying-out action of the sun. Hence a J-M Asbestos Roof remains weatherproof throughout its long life with minimum expense for upkeep. Hundreds of Johns-Manville Built-up Roofs, after more than twenty years of virtually maintenance-free protection against fire, sun and weather, are still in excellent condition.

J-M Rigid Roofinsul

J-M Rigid Roofinsul was designed primarily for use as insulation under J-M Bonded Asbestos Built-up Roofs. Light in weight, with high insulating value, it is also rigid and structurally strong. This insulation is a decidedly worthwhile investment because of the fuel savings it effects in winter and the comfort it provides in warm weather. Furthermore, by preventing condensation Rigid Roofinsul protects the deck against rot or corrosion; and, acting as a resilient cushion between roof deck and felts, it provides protection to the felts by taking up strains due to any movement which may occur in the deck.

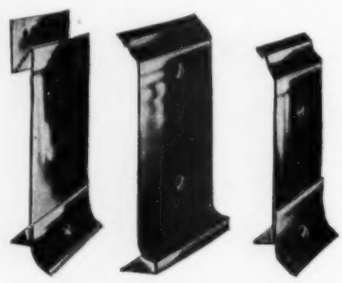
"Facts About Built-up Roofs"

Johns-Manville offers over twenty types of built-up roofs, both smooth and slag or gravel surface—at a complete range of prices. For authoritative data on the entire subject of built-up roofs ask for the new Johns-Manville Brochure, "Facts About Built-up Roofs." It shows why certain materials and methods afford more complete protection from the elements; goes thoroughly into such subjects as flashings, insulation, etc. Profusely illustrated with photographs and drawings.

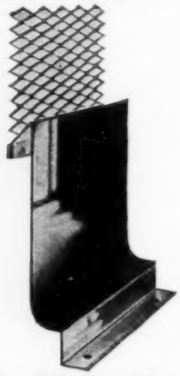
MILCOR STEEL COMPANY

Milwaukee, Wisconsin, 4153 W. Burnham St. Canton, Ohio
Chicago, Ohio Kansas City, Missouri La Crosse, Wisconsin

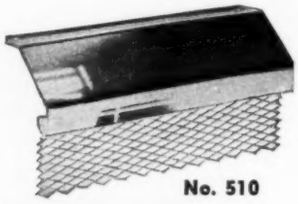
MILCOR INTERIOR METAL TRIM



No. 631 No. 645 No. 643
Metal Bases Without Wings

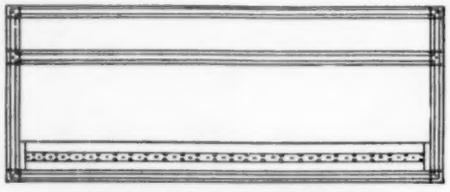


No. 600 Metal Base
With Expansion Wings

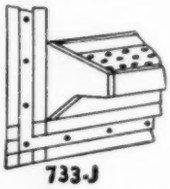


No. 510
Splay Metal Window Stool
With Expansion Wings

No. 760
Chair
Rail



Practical Blackboard Design
Using Milcor Moulds



733-J

No. 500
Metal
Window Stool

Left End Stop for
Chalk Trough No. 733 (Left)

No. 750
Chair
Rail

The Finest and Most Complete Line of Metal Trim Available

Milcor Metal Trim provides the best possible construction for school buildings. Permanence, firesafety, and resistance to use and abuse are features which should be given prime consideration in the building of schools, and these are inherent advantages in the Milcor Line of Interior Metal Trim.

Every desirable type of metal window trim and stool may be found in the Milcor Line, and numerous different installations may be achieved by combining various designs, mouldings and bases. All Fittings are welded to the trim at the factory, an important, exclusive feature.

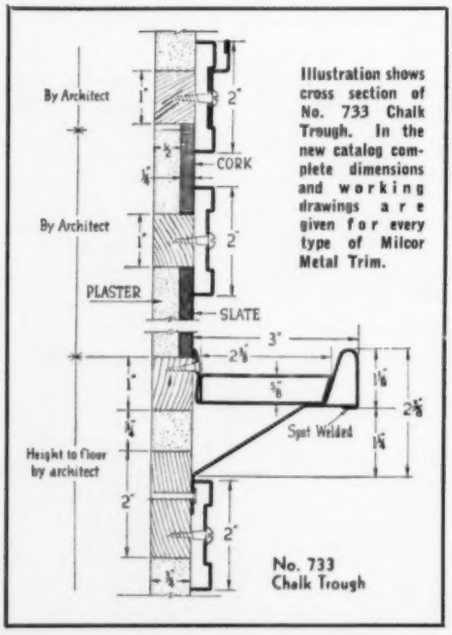


Illustration shows cross section of No. 733 Chalk Trough. In the new catalog complete dimensions and working drawings are given for every type of Milcor Metal Trim.

Milcor Metal Trim is attractive in appearance, sanitary, economical, easy to keep clean and to maintain. It is obviously so much better looking than the old heavy wood trim, that comparison is unnecessary. But even more important than its appearance are the many practical advantages which make it the ideal trim for schools.

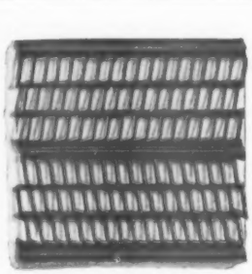
The Expansion Wing, which is a feature of many Milcor Products, provides a permanent plaster bond, preventing checking and cracking of plaster at vulnerable points. And in schools, especially, it is desirable to preserve the original plastered surface.

Products particularly adapted for school buildings are Metal Bases, Metal Cove Moulds, Metal Chair Rails, Metal Blackboard Moulds, and Metal Chalk Troughs.

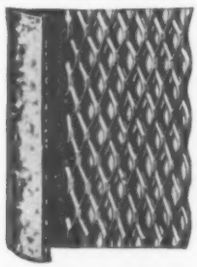
Send for our new Catalog No. 100-B, Specification Manual

MILCOR PRODUCTS
Save with Steel — TONCAN — ARMCO — ANACONDA — Copperweld Steel

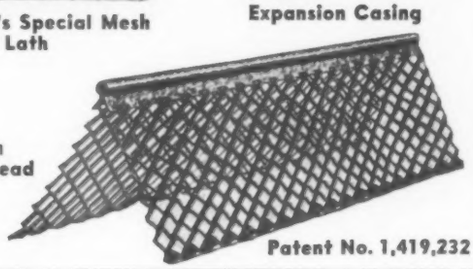
MILCOR PRODUCTS for SCHOOLS



Kuehn's Special Mesh Metal Lath



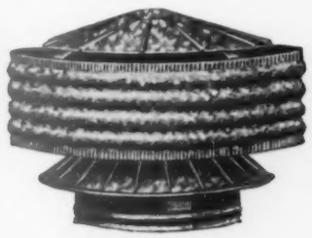
Expansion Casing



Expansion Corner Bead No. 1

Patent No. 1,419,232

Milcor Spinner Ventilator (above)



"Nu-Air" Ventilator

Puttyless Skylight

There is no better plaster base for walls and ceilings of school buildings than metal lath. And there is no better metal lath than Kuehn's Specialmesh. Its scientifically designed mesh gives it a positive plaster grip. There is no plaster waste with this lath, and yet every inch of wall surface is locked permanently into place.

Expansion Casing provides a practical door and window trim. The flush-tight junction of wall and casing insures a sanitary finish, with no cracks to become clogged with dirt.

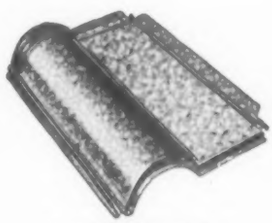
Milcor Expansion Corner Bead is made for outer and inner angles, and its precisely true nose makes a neat, safe, straight-lined corner. The expanded wing, an integral part of the bead, permits the plaster to key through and form a strong bond with the lath beneath, protecting against corner cracks either from blows or strain due to settling.

The Milcor "Nu-Air" is a steel top syphon Ventilator. Breakers and deflectors inside the wind band produce positive suction regardless of wind direction, and insure against back draft at all times. Its design takes into consideration all influencing conditions and compels it to function whenever and wherever there is air movement.

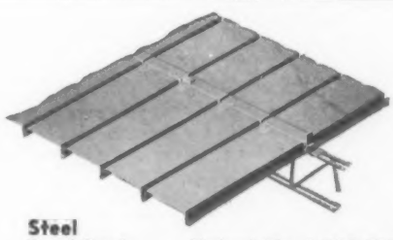
The Milcor "Spinner" Ventilator has great exhaust capacity. The slightest breeze keeps it operating efficiently. As the blades turn, the air in the ventilator head is expelled, creating a vacuum which draws the impure air from the building. Down drafts are an impossibility with this construction.

The Milcor Line of Skylights covers all types and sizes. We furnish recommendations to meet special requirements.

Send for Architectural Sheet Metal Guide No. 24-A describing and illustrating Milcor Ventilators and Skylights



Spanish Metal Tile



Steel Roof Deck

Patent No. 1,969,918

Steel Ceiling Design No. 3010

Spanish Metal Tile is a popular roof for schools. It is light in weight and requires only a light supporting structure. It may be finished in any color desired and lends itself ideally to the general artistic scheme of the building. It is fireproof and lightning-proof.

There is an increasing use of Steel Roof Deck because of its many outstanding advantages. It is light in weight, simple to install, has a wide range of application, and is firesafe. Any standard composition roofing may be applied over it. Our Engineering Department will supply all necessary details if roof plans are sent in.

Metal Ceilings are still one of the most practical materials for remodeling school interiors. They are firesafe, economical and durable; easily cleaned, and vibration, jolts or settling strains do not affect them. The Milcor Line of modern designs includes every desirable type. Send for new booklet.

MINNEAPOLIS-HONEYWELL REGULATOR CO.

2825 Fourth Ave., South, Minneapolis, Minnesota

THE BROWN INSTRUMENT CO.

Division of Minneapolis-Honeywell Reg. Co.

Main Office and Plant—Philadelphia, Penn.

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* Stock carried at these offices

THE MODUTROL SYSTEM OF AUTOMATIC CONTROL
for Heating, Ventilating and Air Conditioning

Room Thermostat

The Modutrol System designation is applied to any combination of Minneapolis-Honeywell Automatic Electric or Pneumatic Controls or Self-contained Automatic Valves used to govern the operation of air conditioning or heating systems other than the small domestic installations.

INCLUDES SUPPLEMENTARY EQUIPMENT

Supplementing the modulating controls is a wide variety of on-and-off or two-position motors, controllers and valves, both electric and air actuated, thus making the Modutrol System extremely flexible as to the selection of control equipment to produce the desired results.

APPLICABLE TO ALL TYPES OF SCHOOL BUILDINGS

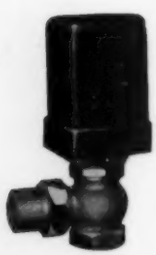
Humidity Controller

The very satisfactory results obtained from installations in many school buildings throughout the entire country during the past several years is a definite indication of the accuracy, flexibility, and reliability of this system of automatic control. Certainly no other general type of installation requires more exacting results under wide variations in load conditions.

EMPLOYS BOTH ELECTRIC AND PNEUMATIC CONTROLS

The Modutrol System is the only one in which both types of control are available, thus enabling us to make a real contribution to the heating, ventilating and air conditioning industry. With the Modutrol System Minneapolis-Honeywell is prepared to offer the most comprehensive and unbiased recommendations for installation in all types of buildings, existing or new, large or small, at prices commensurate with the needs of each project. These recommendations include:

1. Pneumatic control only, where that type of control will give satisfactory service and where low first cost is of special importance.
2. Combination pneumatic and electric control, where a somewhat higher degree of accuracy is needed.
3. Electric control in those installations where the most accurate, flexible and dependable results are required.



Electric Motor Radiator Valve

REDUCES COSTS OF HEATING OR AIR CONDITIONING SYSTEM OPERATION

In new buildings or old, a lowering of operating costs, and an immense improvement in the comfort delivered, can be accomplished by considering the control system as an integral part of the heating system. In fact, automatic control systems today cannot be considered as accessory to the heating systems.

Electric Clock Thermostat

PROVIDES TRUE MODULATION

Viewed from the performance standpoint, the electric controls of the Modutrol System offer the only available means of effecting true modulation of the temperature, air flow and humidity, though pneumatic controls provide a degree of modulation which is satisfactory for many installations. True modulation means automatic proportioning of heat, cold air flow, or humidity in exactly the required amount to offset changes in the heat loss or relative humidity. Further, in the Electric Modutrol System the well known dependability of electric switches and motors, the permanency of electric wiring, the flexibility of self-contained units and the accessibility of each and every portion of the equipment represent just a few of many advantages offered in this modern means of air conditioning control.

RESULT OF OVER A HALF CENTURY'S EXPERIENCE

Fifty-one years of concentration upon temperature control problems has built up within the Minneapolis - Honeywell organization the knowledge, technique and engineering ability which have produced the Modutrol System as well as the comparatively simple domestic control systems.

ENGINEERING SERVICE

The Minneapolis - Honeywell Automatic Control engineer is at your service at all times. He will be glad to furnish you with recommended control layouts and cost estimates.

He is trained to recommend control results before installation of equipment and to produce control results after the installation of equipment has been completed.

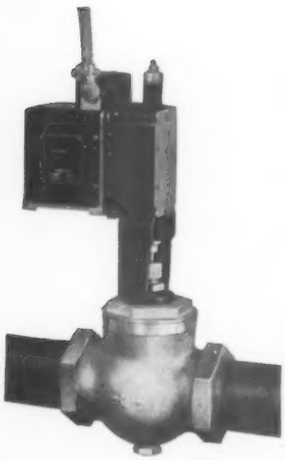
Modutrol Motor

COMPLETE INSTALLATION SERVICE

Minneapolis - Honeywell Branch Offices are equipped to make the complete installation of the **Modutrol System** for control of Air Conditioning or Heating installations. Thoroughly trained men are also available to supervise, adjust, or service the control equipment. A stock of standard control equipment is carried at more than twenty points throughout the country for quick delivery.

RESPONSIBILITY FOR ENTIRE CONTROL SYSTEM

The **Modutrol System** and its supplementary equipment is so complete that the Minneapolis-Honeywell Regulator Co. is equipped to assume the entire responsibility for any control installation, thereby eliminating the difficulties and misunderstandings which the division of responsibility may create.



Motorized Valve

TYPICAL SPECIFICATIONS

A complete set of typical specifications covering automatic control systems for use in heating, ventilating, and air conditioning is available for use by engineers and architects.

DESCRIPTIVE LITERATURE

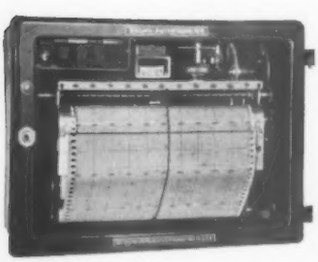
Catalogs arranged according to the following subdivisions are available upon request:

1. The **Modutrol System.**
2. Air Conditioning Controls.
3. Oil Burner Controls.
4. Gas Heating Controls.
5. Stoker Controls.
6. Industrial Regulator Controls.
7. Refrigeration Controls.
8. Complete Condensed Catalog.
9. Brown Instruments for Heating, Ventilating and Air Conditioning.

In addition to this literature, complete data sheets are available, including technical information on all equipment in the **Modutrol System** which is of prime interest to the engineer. These pages will be furnished on request.

PERFORMANCE RECORDS ARE IMPORTANT

In order to get best results at minimum operating costs, indicating and recording thermometers should be used to check the system periodically. Furthermore, the boiler room should be equipped with thermostats, gauges, CO_2 meters, and, in some instances, flow meters. M-H is prepared to supply complete recording and indicating equipment for the boiler room and air conditioning installation, through Brown Instruments.



Brown Recording Resistance Thermometer

TYPICAL INSTALLATIONS IN SCHOOLS

The following list of typical installations of the Modutrol System in school buildings illustrates the wide acceptance of this modern system of automatic control:

Theodore Roosevelt High School, West Orange, N. J.
Roeliff Jansen School, Hillsdale, N. Y.
McKinley School, Montrose, N. Y.
Rockefeller Hall, Cornell University, Ithaca, N. Y.
Saint Mary's School, Port Chester, N. Y.
Central School Building, Pine Plains, N. Y.
Rodger Ludlow School, Fairfield, Conn.
Harkness Memorial Building, Yale University, New Haven, Conn.
Warren Township School, Warren Twp., N. J.
Norwich Free Academy, Norwich, Conn.
Harris School, Needham, Mass.
Villanova Gymnasium, Villanova College, Villanova, Penn.
Mt. Pleasant Junior High School, Bellevue, Del.
Residence Park School, Dayton, Ohio
Gibbens, Caldwell, and McMahon Halls, Catholic Univ., Wash., D. C.
Mary E. Miller Vocational School, Minneapolis, Minn.
Eagle Lake School, Cromwell, Minn.
Sheridan School, Minneapolis, Minn.
North Aurora Grade School, Chicago, Ill.
Nathan Hale Grade School, West Allis, Wis.
Astronomical Library, Harvard Univ., Cambridge, Mass.
Wellsboro High School, Wellsboro, Penn.

THE NATIONAL TERRAZZO and MOSAIC ASSOCIATION

1406 G Street NW, Washington, D. C.

Bright and colorful, yet durable and low in maintenance cost, terrazzo makes an ideal material for entrance halls, lobbies, school offices and corridors

A NEW SERVICE

To supply a convenient national headquarters to which school executives and architects can turn for dependable information on terrazzo, The National Terrazzo and Mosaic Association, Inc., maintains an office located at 1406 G Street NW, Washington, D. C.

● Made with marble chips, portland cement and water, plus mineral color pigment where desired, and separated by dividing strips to guard against cracking, terrazzo floors have these advantages: (1) colorful beauty, (2) flexible, individual designs, (3) the permanence and durability of concrete, (4) economy and ease of installation and maintenance.

For floors in the entrances, corridors, classrooms, offices and laboratories of school buildings, where severe wear makes durability the major flooring requisite, terrazzo provides a dense, hard, wear-proof surface. And because the range of color in marble chips and pigment combinations is practically unlimited, terrazzo is as colorfully beautiful as it is durable.

In design there are likewise no limitations. Simple, repetitive patterns or detailed pictorial designs are carried out in terrazzo floors precisely as planned. Each terrazzo floor may have an **individual** motif, or the terrazzo floors throughout the school building may follow one central design.

School floors must be durable, but they need not be drab. School floors can be bright and colorful and cheerful and at the same time give long, economical service—built with terrazzo. Detailed information and complete specifications will be sent promptly upon request.

In addition to its permanent durability and good appearance, terrazzo's flexibility in design (well illustrated in this floor with its map design) makes it particularly appropriate for school use

Colorful, durable terrazzo floor in Samuel Gompers High School for boys in New York City

Practical application of terrazzo in swimming pool construction

NATIONAL WOOD PRODUCTS

DIVISION OF

EVANS PRODUCTS CO.

Union Guardian Building, Detroit, Mich.

WOOD FLOORING

The day of leather strap discipline and the "three R's" has passed from our school systems. Today teaching methods are modernized and the health of students is a paramount concern with every school board.

And what is more important to the health of pupils than the type of flooring they use for walking, working and playing?

Wood flooring is a living thing. In its best mood wood flooring is the finest possible floor covering. But, being temperamental, it takes a lot of careful "handling" by the manufacturer in the proper selection, cutting and kiln drying of the lumber.

Evans engineers have spent many years in studying the moods of wood flooring and meeting these moods with engineering refinements, not the least of which is the Evans spring expansion joint.

The net result is a little family of three types of flooring all sturdy and strong with beauty and long life built in. And all of these floors are "well trained." Exclusive engineering features make them the longest lasting, most sanitary and fireproof wood floors in their respective classifications but have eliminated the troubles common in ordinary wood floors.

EVANITE

"The Floor Beautiful"

Because of its excellent appearance and resistance to wear EVANITE is particularly recommended for the floors of classrooms, service rooms, lecture halls, libraries, auditoriums, etc.

Laid directly on concrete subfloors in a cushion of mastic, which retains its resiliency indefinitely, EVANITE is **quiet, sanitary** and **fire resistant.**

Specially milled from thoroughly air and kiln dried selected stock (not standard strip flooring stock) EVANITE consists of accurately machined strips joined with a special waterproof casein glue and two hardwood dowels inserted entirely through each block, at right angles to the grain of the wood.

An unusual feature of EVANITE installations is a highly efficient spring expansion joint providing most complete protection against expansion and contraction in wood block floors.

Above—George H. Nichols School, Endicott, N. Y. Architects, A. T. Lacey & Sons, Binghamton, N. Y. Evanite was used exclusively as illustrated in one of their typical classrooms which is shown at the right

EVERLEVEL

"The Heavy Duty Floor"

Where extremely heavy traffic is the rule EVERLEVEL is the answer. Applied in resilient mastic, EVERLEVEL is a remarkably quiet floor for shops, receiving rooms and other places requiring exceptional wearing quality but where natural noise must be deadened.

EVERLEVEL is not just another wood block flooring. Its construction is such that it forms a carpet of wood when laid.

EVERLEVEL is made from selected yellow pine in 1½", 1¾", 2" or 2½" thicknesses. The individual end grain blocks are assembled into strips up to 6 feet in length by means of full length dowels. The strips are then completely secured into a single unit by tight fitting galvanized steel splines laid in continuous strips the entire length or width of the floor.

Holland Patent Central School. Architects, Kinne & Frank, Utica, N. Y.

LAMINITE
The Floor Eternal

LAMINITE fir plywood flooring might be called the prodigy of the Evans flooring family. There is no floor like LAMINITE. Its fully patented features set it up in a class by itself.

The principle of plywood is not new. Neither is the great wearing quality of end grain a recent discovery, but it was left to LAMINITE to combine the strength and resiliency of plywood construction with the wear-resisting features of end-grain wood.

The largest and finest Douglas fir logs go into the manufacture of this flooring. Alternate strips of end and edge grain laminations are put together with waterproof glue, tongued and grooved and bored for lateral nailing. The result is a floor which positively will not cup.

LAMINITE is used for all installations from library to work shop, particularly where quietness is desired and appearance also is important. Typical examples are class rooms, gymnasiums, stages, auditoriums, and manual training rooms.

Manufactured in eight foot strips and in thicknesses from $1\frac{1}{16}$" to $3\frac{1}{2}$" LAMINITE flooring may be laid in any manner in which other types of flooring are laid. It may be applied in mastic directly on concrete subfloors, on sleepers, or nailed to wooden subfloors.

Illustrated above is the Salina School, Syracuse, N. Y., in which Laminite flooring was installed. Architect, Carl W. Clark, A.I.A., Cortland, N. Y.

At the right is shown the gymnasium of the West Scranton Jr. High for which Laminite was selected as the ideal flooring

Catalog including typical specifications for each type of floor will be furnished on request.

NATURAL SLATE BLACKBOARD CO.

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Pen Argyl, Pa.

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MEMPHIS, TENN.
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WASHINGTON, D. C., 327 Bond Bldg.
NEW ORLEANS, LA., 816 Howard Ave.

NATURAL SLATE BLACKBOARDS

The superiority of natural slate blackboards over any type of composition board is too well known to require any further mention.

The production of blackboard slate is confined to a single small area in Lehigh and Northampton Counties, Pennsylvania. The quarries in these counties produce the best blackboard material on account of the unusually fine cleavage of the slate and the thickness and size of the beds. Up to 1916, the demand for blackboard slate was taken care of by many individual companies independently operating separate quarries. The organization of the majority of these companies in that year to form the **Natural Slate Blackboard Company** has made possible the highest type of production, storage and service facilities, unequaled except by those of the **Structural Slate Company,** which in the field for **other** uses of slate comprises the member quarries of the **Natural Slate Blackboard Company** and others in the same district.

"CENTURIES OF SERVICE"
PYRAMID NATURAL SLATE BLACKBOARDS
Proof against Time - Wear - Water - Fire

The "Pyramid" Brand, the name given to all slate furnished by the Natural Slate Blackboard Company, was adopted as a trademark and as a guarantee of the enforcement of the most rigid rules of workmanship and inspection in order to assure the best possible selection for the purpose. Calling for "Pyramid" Brand not only provides a selected slate from the best slate beds in the world but assures you of unsurpassed workmanship and delivery service

Facilities and Service of the Natural Slate Blackboard Company

Selected quarries have been specially equipped to develop maximum production of the particular kinds and sizes of slate blackboards for which such quarries are best adapted.

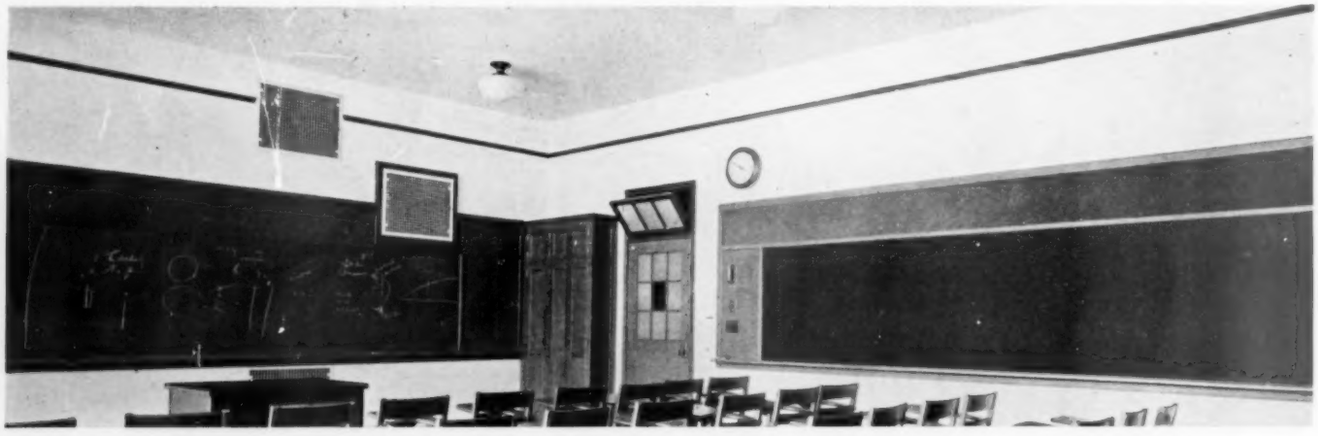
Methods of extraction and storage have been coordinated.

Increased mill production has been facilitated through division of work among these quarries.

This organized procedure enables a huge and constantly moving stock to be always available, from which, without any delays whatever, shipments may be made of any quantity of slate in sizes to meet any requirement.

Each slate blackboard expertly finished, fitted and jointed, assures continued satisfaction through the equipment and service of this Company. The facilities of our Service Department at Pen Argyl and of our branch offices are at the disposal of every user. **Write to, or consult, the branch office nearest you, in regard to any information desired, on "Pyramid" natural slate blackboards or any other uses of slate.**

A minimum of 500,000 sq. ft. carried constantly in stock ensures guaranteed prompt deliveries.



Typical Class Room, Teachers College, Buffalo, N. Y. William E. Haugaard, Commissioner of Architecture, New York State

THE STRUCTURAL SLATE COMPANY

EXECUTIVE OFFICES
Pen Argyl, Pa.

BRANCHES

ATLANTA, GA., 213 Red Rock Bldg.
BUFFALO, N. Y., Erie County Bank Bldg.
CHICAGO, ILL., 737 N. Michigan Ave.
CINCINNATI, OHIO, 3629 Idlewild Ave.
DALLAS, TEXAS, P. O. Box 2324
DETROIT, MICH., 111 Gladstone
KANSAS CITY, MO., 1730 Grand Ave.
MINNEAPOLIS, MINN., 1822 Jefferson NE.
MEMPHIS, TENN.
NEW YORK, N. Y., 110 E. 42nd St., Rm. 701
PHILADELPHIA, PA., 244 N. 10th St.
PITTSBURGH, PA., Rm. 208 Investment Bldg.
ST. LOUIS, MO., 1617 Lafayette Ave.
SOMERVILLE, MASS., 43 Prospect St.
WASHINGTON, D. C., 327 Bond Bldg.
NEW ORLEANS, LA., 816 Howard Ave.

STRUCTURAL SLATE FOR VARIOUS SCHOOL USES

In addition to producing the world's best blackboard slate, Northampton and Lehigh Counties of Pennsylvania also produce an abundant supply of the highest grade structural slate for various other uses. The majority of the quarries in this far-famed slate district cooperate through one organization —the **Structural Slate Company**—in order to develop the most efficient standards of extraction, workmanship, assembling, distribution and methods of installation, as well as to encourage the maximum production and use of slate. All slate produced by this organization is thoroughly inspected before and after working, and is given the trade name of "Pyramid."

"Pyramid" Brand slate assures the consumer of receiving always the highest quality of slate, selected by experts, and fabricated in any desired size for such uses as toilet enclosures, urinal stalls, shower stalls, laundry tubs, sinks and sink tops, stairways, caps, bases, wainscots and floors. Many standard sizes are always in stock, and deliveries can be made promptly. Normal capacity—5 carloads daily

Structural Characteristics of "Pyramid" Slate

Among the chief characteristics of structural slate from the Pennsylvania quarries are its **fine, even grain,** its **uniform color,** and its **cleavage or fissility,** which allows it to be split into slabs of any required thickness. Slate is also one of the **least absorptive** of nature's products, having a mean absorption of only 174/1000 of one per cent when immersed in water for 24 hours. It is also extremely **tough** and **elastic,** as manifested by its resistance to strain, shock, blows and the effect of settlement. Moreover, it **will not contract or expand** under changing conditions of heat or humidity.

Uses of "Pyramid" Structural Slate in School Buildings

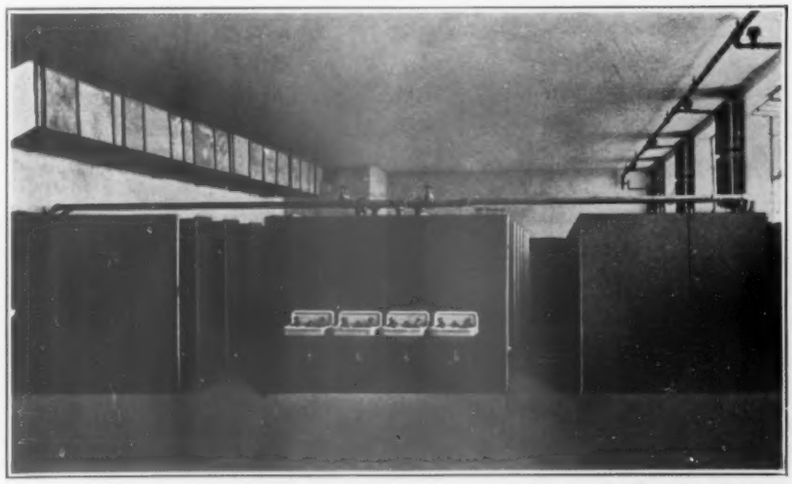
The most common uses of "Pyramid" structural slate in school buildings are for **shower stalls** and **toilet enclosures.** A review of the characteristics of structural slate in the preceding paragraph quickly shows why this slate is admirably fitted for these two uses. In selecting fixtures used for plumbing and sanitary purposes, slate will be found to fulfill easily the most rigid requirements with respect to resistance to wear and tear, sanitary qualities and imperviousness to water.

Other school uses for "Pyramid" Slate include:

BASE	TREADS AND PLATFORMS	TILE
RISERS	SWITCHBOARD PANELS	COPING
FLAGGING	STOOLS & SADDLES	SHELVING
PARTITIONS	FLOORS & WALKS	THRESHOLDS
URINAL STALLS	WINDOW SILLS	SINKS & TRAYS
ROOFING SLATE	TABLE TOPS	RADIATOR TOPS

Write us direct or our nearest Branch Office for estimates and any other information desired.

Use slate for stairways. It is fire-resistant and wear-resistant!



Slate shower installation in High School building, Bethlehem, Pa.

THE POWERS REGULATOR COMPANY

45 Years of Temperature and Humidity Control

Chicago
2724 Greenview Avenue

OFFICES IN 45 CITIES
See Your Phone Directory

New York City
231 E. 46th Street

AUTOMATIC TEMPERATURE AND HUMIDITY CONTROL

For Heating, Ventilating, and Air Conditioning Systems

At Harvard, Yale, Princeton, Vassar, Wellesley and hundreds of other prominent educational institutions will be found buildings equipped with the Powers Pneumatic System of Automatic Temperature and Humidity Control.

Over 45 years of experience in developing and installing automatic control for heating, ventilating and air conditioning equipment in all types of old and new buildings qualify us to assist school executives, architects, and engineers on any problem of temperature and humidity regulation.

Powers pneumatic systems often cost more than other types but they are worth more because: they often give 15 to 20 years of accurate and dependable control without repair expense.

Powers thermostats do not get out of adjustment permitting UNDER-heating and OVER-heating which not only wastes fuel but causes discomfort. Neither the extreme heat of Summer, sub-zero temperatures of Winter, nor the vibrations in some buildings, change their adjustment. They need no annual overhauling or adjustment, and the true gradual action of their powerful vapor disc controls valves or dampers gradually—resulting in exceedingly accurate regulation.

Write for Estimate. Let one of our engineers study your requirements and submit an estimate of the cost of installing the type of control best suited to your needs.

Self-operated Controls. We also manufacture a very complete line of self-operating temperature regulators that do not require electricity or compressed air for their operation. **Write for bulletins,** if interested.

Some of the many Schools, Colleges, and Universities using Powers Automatic Temperature Control

California Institute of Technology, University of Chicago, Creighton University, Dartmouth College, Georgetown University, Harvard University, University of Illinois, Lehigh University, Louisiana State University, Massachusetts Institute of Technology, University of Michigan, University of Missouri, Purdue University, Smith College, Vassar College, University of Washington, Wellesley College, Yale University

Los Angeles, Cal.	20 Schools	Kansas City, Mo.	40 Schools
Washington, D. C.	21 Schools	St. Joseph, Mo.	12 Schools
Chicago, Ill.	21 Schools	St. Louis, Mo.	10 Schools
Indianapolis, Ind.	24 Schools	Montclair, N. J.	14 Schools
Sioux City, Iowa	11 Schools	Newark, N. J.	12 Schools
Wichita, Kan.	12 Schools	New York City, N. Y.	17 Schools
Boston, Mass.	11 Schools	Yonkers, N. Y.	19 Schools
Brookline, Mass.	11 Schools	Cincinnati, Ohio	13 Schools
Fall River, Mass.	11 Schools	Cleveland, Ohio	21 Schools
New Bedford, Mass.	14 Schools	Oklahoma City, Okla.	19 Schools
Worcester, Mass.	19 Schools	Philadelphia, Pa.	23 Schools
Detroit, Mich.	24 Schools	Seattle, Wash.	14 Schools

SAFETY WATER MIXING VALVES

Safety Shower Mixers

A complete line of both pressure equalizing valve and thermostatic shower mixers that protect bathers from scalding temperatures caused by pressure and temperature fluctuations in pipe lines, and prevent sudden "shots" of hot or cold water. Maximum temperature of delivery can be limited.

For Individual Showers

Thermostatic Water Controller

For group or gang showers, zone or progressive showers. Will mix hot and cold in quantities up to 100 gallons per minute and deliver at any temperature desired. Delivery temperature is not affected by temperature or pressure changes in the supply lines.

For Group, Gang or Progressive Showers

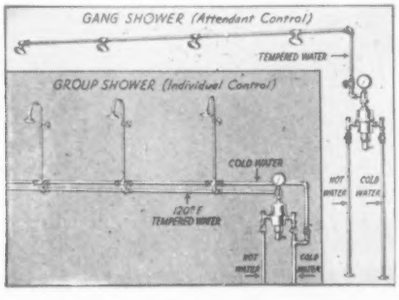
Group or Gang Shower Control—Powers Thermostatic Water Controllers are used for the control of shower baths in groups varying in size from 4 to 20 stalls. They may be used to establish a maximum temperature of hot water supply to protect the entire group from danger of scalding, or to place the entire group of showers under the control of an attendant.

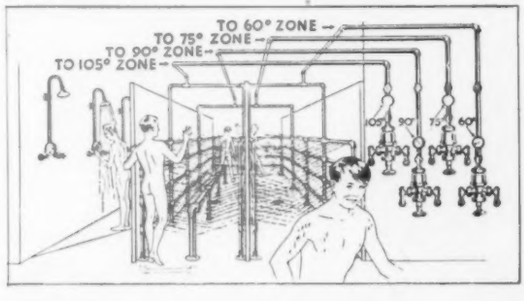
Individual Shower Control is best suited for adults as it permits each bather to individually adjust the temperature of his shower while the hot water is kept at a safe maximum temperature.

Attendant Control is best suited for the bathing of children in schools, institutions, etc., as the temperature of the entire group of showers is adjusted by one individual.

Zone or Progressive Showers—Where compulsory bathing is required before entering swimming pools, lane showers are divided into four zones, each controlled by a Powers Controller. First zone is maintained at 105° F.; second at 90° F.; third at 75° F.; and fourth at 60° F. Because of its efficiency and its hygienic and sanitary advantage, this type of shower is rapidly increasing in popularity.

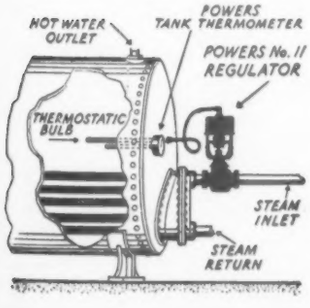
Write today for new 24-page Bulletin No. 258 which shows photographs of a variety of modern shower installations. It gives helpful advice in laying out shower rooms and completely describes Powers Safety Water Mixing Valves.





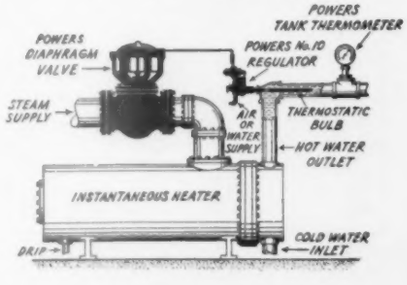
TEMPERATURE CONTROL FOR STEAM HEATED HOT WATER HEATERS

Self-operated



The most complete line of money saving regulators for this purpose. Often pay for themselves during the first year and give dependable control for 15 to 20 years. All steam valve sizes up to 10 inches. **Write for Bulletin No. 2035.**

Compressed Air or Water Pressure Operated



SERVICISED PRODUCTS CORPORATION

Manufacturers and Distributors

MAIN FACTORY — Chicago 6051 West 65th St., Chicago, Ill. BRANCHES IN PRINCIPAL CITIES

WHEN you are considering materials for school construction, remember that Servicised Quality products are giving exceptional service in this field. Continuous development of better products has won for **"Servicised"** leadership in the application of plastic, elastic and waterproofing materials to better building.

SERVICISED PRODUCTS FOR SCHOOLS

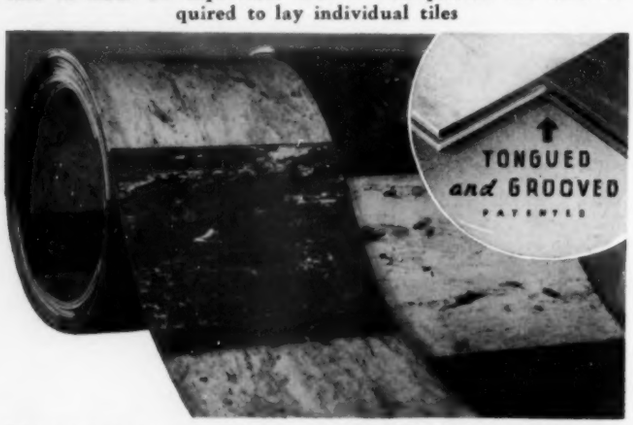
- Asphalt Expansion Joints
- Cork Expansion Joints
- Cork-Rubber Expansion Joints
- Sponge-Rubber Expansion Joints
- Asphalt Plank Flooring—Plain, Rock-Surfaced and Armored
- Asphalt Roof Decking
- Syra-Bord Interlocking Rubber Flooring
- Cork-Rubber Tile
- Rubber Tile Flagging
- Safety Stair Treads
- Waterproofing Materials
- Asphalt Floor Tile

SYRA-BORD RUBBER FLOORING

SYRA-BORD Rubber Flooring is making architectural history. It has revolutionized all previous standards of laying and maintaining rubber floors. Syra-Bord gives color and comfort and cuts cost of installation.

It makes a beautiful, resilient floor which cannot warp, curl, creep nor crack—and can be easily laid by any handy man at one-quarter the cost of installing single tile.

Syra-Bord Rubber Flooring is made in 10 ft. strips which can be laid to make an impervious floor in one-quarter the time required to lay individual tiles



The accurate tongue-and-groove joint shown in upper right corner ensures a perfect-fitting floor covering

The unique feature of Syra-Bord is that it comes in 10-foot slabs, tongued and grooved on sides and ends for tight and interlocked matching. The pattern blocks are held together by a flexible stock which acts as an expansion joint between blocks. It cannot be laid wrong since it fits together so easily and accurately. Syra-Bord is not merely a floor covering but a floor in itself.

A variety of non-fading colors and a wide range of patterns, both mottled and solid, are available. Slabs are furnished in 6″, 9″, and 12″ widths, 10 feet long and 3/16″ or 1/4″ thick.

Syra-Bord is recommended as economical and pleasing for any public room. We shall be glad to send you a special detailed folder and color chart on Syra-Bord, the rubber flooring innovation.

RUBBER FLAGSTONE TILE

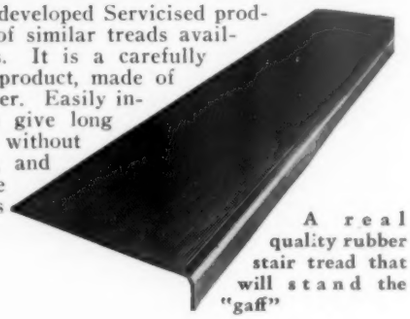
Brilliant in appearance, pleasing in design and color combinations, Servicised Rubber and Cork Rubber Flagstone Tile is rapidly coming into vogue for service floors which must be durable as well as attractive.

This flagging is usually laid in lobbies, reception rooms and entrance halls but it is equally adaptable to any floor space in the building. It has a distinctive and "livable" personality all its own and, in addition, provides a durable, easily-cleaned floor which is restful under-foot.

Rubber Flagstone Tile

SERVICISED RUBBER SAFETY TREAD

This is a recently developed Servicised product, far in advance of similar treads available at retail stores. It is a carefully moulded and cured product, made of finest pure para rubber. Easily installed, these treads give long and reliable service without cracking or peeling, and with high resistance to abrasion, oil, acids and moisture.

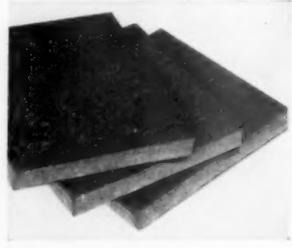


A real quality rubber stair tread that will stand the "gaff"

CORK-RUBBER TILE

Over a period of three years, Servicised engineers have checked up on Servicised Cork-Rubber Tile, both in actual service and in the laboratories. Their findings are conclusive: this new Servicised product meets all requirements for an ideal, silencing, resilient flooring material.

Its advantages: (1) High dirt resistance; (2) Flexible, conforming to minor variations of base without breakage; (3) Resists indentations and scratches; (4) Impervious to air, water and acids; (5) Light, yet very strong; (6) Lasting Beauty.

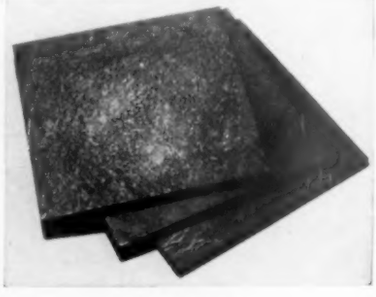


Cork-Rubber Type Flagstone Tile

Servicised Cork-Rubber Tile is a great improvement over cork flooring with a resin binder. It will give better service and deserves consideration for vestibules, corridors, gymnasium floors, libraries, infirmaries, etc.

ASPHALT TILE

When your problem is a floor below grade Servicised Asphalt Tile is the answer. It is durable and acid resistant, therefore extensively used in all types of school and college buildings. "Servicised" has for 17 years compounded Asphalt products, and now offers this new tile which conforms to standard specifications and meets the most rigid tests. A splendid variety of solid colors are available and some very effective marbleized patterns. For further information and detailed specifications write to us at once.



Detailed Bulletins on these specialized flooring products will be furnished promptly at your request.

Use SERVICISED materials for tile installation work. SERVICISED underlayment to cover wood floors unsuited to saturated felt. SERVICISED asphalt primer or binder for smoothing uneven and rough concrete.

SERVICISED ASPHALT PLANKING FOR SCHOOL CONSTRUCTION

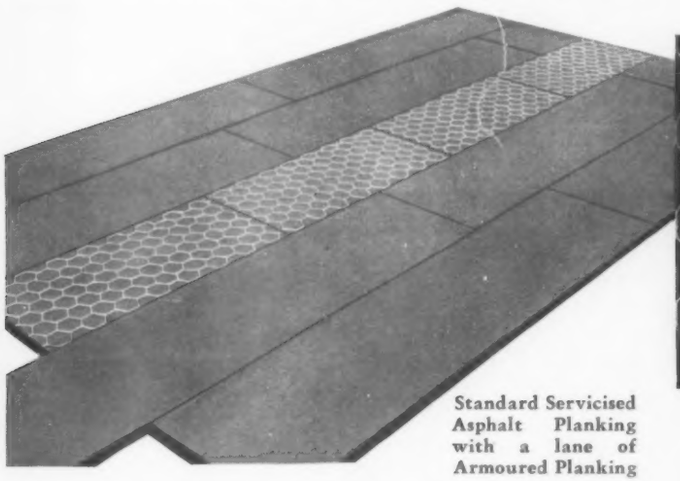
Asphalt planking is rapidly replacing other materials, such as wood, concrete and poured floorings in School construction. It is more resilient, silent, easier to keep sanitary and lasts longer than other types of floors, especially those surfaces subjected to constant heavy wear. As leading producers of preformed asphalt joints and allied products for more than seventeen years, Servicised can assure you that this Asphalt Planking is of topmost quality.

SCHOOL USES OF ASPHALT PLANKING

Stair Treads	Ramps
Walkways	Siding
Corridors	Engine Room Floors
Roof Decks	Refrigeration Insulation
Waterproof Protection Course	Loading Platforms

Servicised Asphalt Planking is made in three practical types, Plain for ordinary use, Rock-Surfaced, for heavy-duty, non-slip use, and Steel Armored for exceptionally heavy duty.

The planking is extruded, in convenient sizes, under extreme pressure, from acid-resisting, waterproof asphaltic material. It is worked as easily as wood planking but outlasts wood by many years, preserving a smooth and almost indestructible surface. It also outlasts concrete and will not spall nor chip.



Standard Servicised Asphalt Planking with a lane of Armoured Planking

Fibres of felt and asbestos incorporated in the bituminous material give stability while a special mineral filler adds toughness and resistance to wear. Tested for more than ten years in tough service on bridge surfacing and heavy trucking traffic lanes, it has decisively proved its merit as a planking which combines durability, lightness and safety.

ROCK-SURFACED ASPHALT PLANKING

For roadways, walks, stairs, etc., where non-slip safety is desirable Servicised Rock-Surfaced Plank is the regular specification. In this type rock particles are imbedded in the asphalt while hot, under great pressure, so that the planking material surrounds and locks in the rock. The result is a perfectly even surfaced plank which offers substantial resistance to slipping.

SERVICISED ARMORED PLANKING

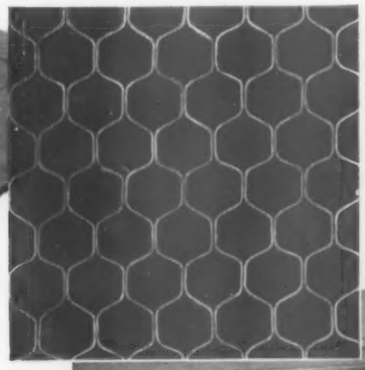
A comparatively recent Servicised product is Armored Planking, yet it is one which has been installed in sufficient quantities to demonstrate its efficiency.

It consists of a heavy metal grill work into which Servicised Asphalt Planking material is securely imbedded. The metal serves to increase the durability of the plank in resistance to abrasion and also to control any possible flow of the imbedded material under extreme conditions of heat and pressure.

It has been found that Servicised Armored Planking makes a practically indestructible protection on heavily traveled surfaces. Ideal for use in large schools and colleges on main stairways, walkways, corridors and drives.

All three types of Servicised Asphalt Planking are made in graduated thicknesses from ½ inch to 2 inches, in convenient lengths. They may be nailed or cemented in place, according to the nature of the base. Full details are contained in our complete catalogue which will be gladly sent on request.

Engineering Data on these Servicised Products is instantly available from our Engineering Department. Descriptive literature will be sent you, with no obligation, and inquiries as to specialized requirements will receive our prompt attention.



Construction of Servicised Armored Asphalt Planking

Metal Armored Asphalt Planking can be easily installed on metal stairways, making them safe and long-wearing

SERVICISED PRODUCTS CORPORATION
6051 W. 65th St., Chicago

SLOANE-BLABON CORPORATION

W. & J. SLOANE, SELLING AGENTS DIVISION

295 Fifth Avenue, New York, N. Y.

THERE IS A SLOANE-BLABON FLOORING FOR EVERY TYPE OF SERVICE

No one flooring can give the most service per dollar on every type of floor. Where traffic is heavy it is poor economy to use a light weight flooring. Conversely, where traffic is light it is unnecessary to install a material designed to withstand severe abuse. That is why Sloane-Blabon produces Plain, Jaspé and Inlaid Linoleum and Cork Carpet in a wide range of service weights.

Sloane-Blabon Jaspé Linoleum not only provides the foundation of the decorative scheme in this attractive reception room but is also employed as a dado around the walls and as a protective facing for the reception desk

Quality Exceeds Government Specifications

Only the finest of raw materials are used in Sloane-Blabon Linoleum and Cork Carpet, and throughout the process of manufacture a rigid check is maintained to insure quality in the finished product. Many thousands of yards of Sloane-Blabon flooring have been installed in the U. S. Navy's recently commissioned aircraft carriers and cruisers. As everything the Navy purchases must meet the stringent Navy Specifications, we feel that this is more convincing than anything we could say.

Easy to Clean and Inexpensive to Maintain

Sloane-Blabon Linoleum is sanitary, for it is impregnated with a lustrous wear-resistant wax finish which seals the pores and prevents dirt from being ground in. Cleaning is thus a very easy task; and maintenance, too, is easy, for an occasional re-waxing is all that is required to restore the original lustre.

A gymnasium floor must be easy to clean and must withstand unusual wear. Sloane-Blabon Battleship Linoleum combines these qualities with an attractive appearance

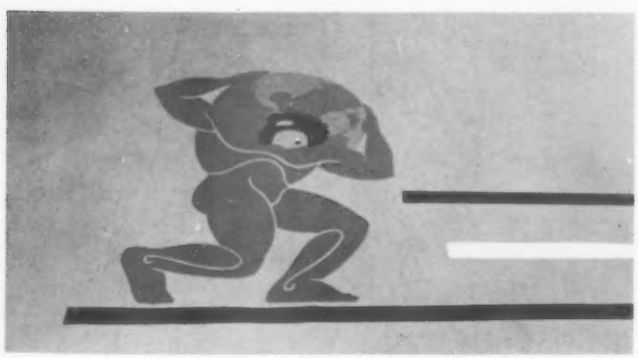
Cork Carpet for Quiet Libraries

In libraries and other rooms where absolute quiet is essential, Sloane-Blabon Cork Carpet makes the ideal flooring. It not only reduces footfall noise to a minimum but it actually serves as a sound-absorbent and tends to reduce the general noise level of the room.

Where perfect quiet is desired we recommend Sloane-Blabon Cork Carpet. But Sloane-Blabon Linoleum is quiet, too, for its surface is not only impervious to wear but resilient as well

Special Patterns for School Use

Sloane-Blabon patterns are created by a staff of designers who have achieved an unchallenged reputation for style leadership. Included in the large selection available are many patterns expressly designed for school and university use and, where the occasion demands, we are equipped to produce elaborate insets and borders to your own specifications.



An example of the type of insets possible with Sloane-Blabon Linoleum. School insignia or other designs to your own specifications may be inlaid in the linoleum itself

School Service Department

Our School Service Department will be glad to assist you with your particular flooring problem. We can help you, not only in choosing the most economical types of flooring for different interiors but in the selection of patterns best suited for large or small areas and the best colors for use under varying light conditions. As the care with which flooring is installed is just as important as the quality of the flooring material, the selection of a contractor deserves serious consideration. Here, too, we can help you for we can recommend a reliable contractor who is qualified by past experience with your specific type of installation. There is no obligation whatever for this service. If we may help you, please feel free to write us at length.

For the school lunchroom or cafeteria Sloane-Blabon Inlaid Linoleum makes an attractive and thoroughly practical flooring. Its sealed surface allows neither dirt nor grease to penetrate

• • •

SLOANE-BLABON CORPORATION

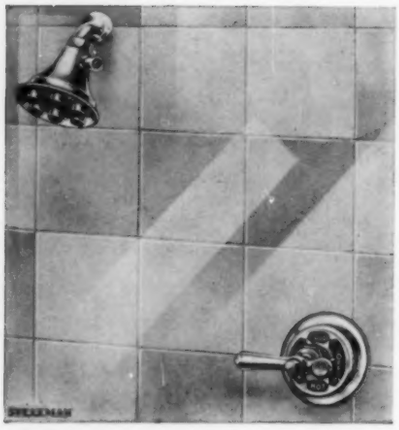
W. & J. SLOANE, SELLING AGENTS DIVISION

295 Fifth Avenue, New York, N. Y.

SPEAKMAN COMPANY

Wilmington, Delaware, U. S. A.

SHOWERS AND SHOWER HEADS



K-3100

K-3100—SPEAKMAN Built-in Mixometer Shower. Size ½ inch. Mixometer with metal wall plate and metal lever handle. Anystream Self-Cleaning Head with lock-shield control. Short, 30° angle flanged shower arm drilled for expansion or through bolts

K-3105—Same as K-3100 but with Hi-Seat Valves with unions. Renewable seats, metal escutcheons and metal handles

K-3315—SPEAKMAN Columbia Shower. Size ½ inch. Compression valves with cast wall lugs and metal handles. Supplies to overhead 36 inches long. Horizontal discharge arms setting head 15 inches off center. Anystream Self-Cleaning Head with lock-shield control set at 30° angle

K-3310—Same as K-3315 but with Mixometer with cast wall lugs and metal lever handle

K-3315

Normal Spray

Needle Spray

Flood Spray

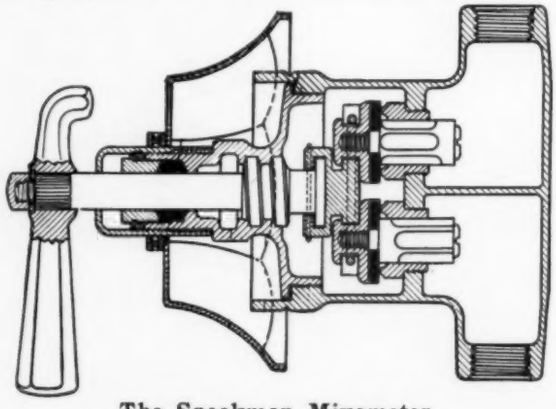
K-3395—SPEAKMAN (Patented) Anystream Self-cleaning Shower Head with lever handle control. ½-inch size. Ball joint not furnished unless specified

K-3399—SPEAKMAN Wall Type Anystream Self-cleaning Shower Head

Speakman Company makes a complete line of showers, shower heads and plumbing fixtures designed for use in schools, colleges, universities and institutions. In designing this equipment particular attention has been given to water economy, as well as cost upkeep. Speakman Showers and Fixtures are sturdy in construction and easy to operate, and all parts subject to wear are renewable.

The Anystream Self-Cleaning and Adjusta-Spray Shower Heads eliminate the annoyance caused by stopped-up shower heads. Both have self-cleaning features with variable spray adjustment. Instead of holes in the face of Anystream Self-Cleaning Head, plungers with tapered grooves give full, round, unbroken sprays. By turning the handle the bather may select a normal, needle, or flood shower spray. The flood spray flushes out any dirt or sediment.

On installations where funds available will not permit the use of the Anystream Self-Cleaning Head, we recommend the Adjusta-Spray Head. Grooved slots in the face discharge water at three different angles, insuring a well distributed spray—not a hollow-centered, cone-shaped spray.



The Speakman Mixometer

The name "Mixometer" means to mix and measure. The Mixometer mixes hot and cold water to a mechanical exactness and measures the volume so that an equal amount of water passes through the shower at all temperatures. With the Mixometer, cold water follows the first fractional turn of the handle, then warm, and finally hot, if desired; but it is impossible to get hot water first.

K-3396—SPEAKMAN Anystream Self-cleaning Shower Head with ½-inch I. P. female inlet and lock-shield arranged to operate by a key

K-3397—Same as K-3396 but with screwdriver control

K-7047—SPEAKMAN (Patented) Adjusta-Spray Shower Head with integral ball joint having ½-inch I. P. inlet

K-7052—SPEAKMAN Wall Type Adjusta-Spray Shower Head. ½-inch I. P. size back inlet

K-1001 — SPEAKMAN Si-Flo Closet Flush Valve. Has 1-inch capped angle stop for right or left inlet, wall flange, metal oscillating handle, flush connection, spud coupling nut and flange for 1½-inch top supply (Patented)

K-1701—SPEAKMAN Si-Flo Urinal Flush Valve for stalls. Has ½-inch capped angle stop for right or left inlet, wall flange, metal oscillating handle, flush connection, spud coupling nut and flange for ¾-inch top supply

Speakman Si-Flo Flush Valve

The Si-Flo Flush Valve eliminates all noises heretofore associated with flush valves, because these noises are prevented from forming. The Si-Flo Flush Valve is quiet in operation, is efficient, and works equally as well under high or low water pressure. This flush valve roughs in on standard measurements and can be used for new installations or to replace noisy flush valves. It can be furnished with right, left or back supply; built in the wall or seat-action type. The Si-Flo Flush Valve can also be supplied for urinals and metering showers.

The Compact Piston Unit

The Si-Flow Flush Valve has no metal to metal wearing parts. The piston is made of a hydraulically moulded composition noted for its long wearing qualities and resistance to solvents, alkalis, and acids. The gaskets are made of the best grade moulded rubber composition, and are positively non-curling. The cup leather is hydraulically formed and treated so that it will retain its shape and pliability indefinitely.

This unit can be replaced in five minutes at nominal cost.

Anti-Syphon Devices

Anti-Syphon stop will be supplied without extra charge when sanitary code requires it. Where Anti-Syphon stop is angle pattern, state whether it is to rough-in right or left. Where Anti-Syphon Stop will not meet code, a Back Syphon Preventer can be furnished at slight extra cost.

Piston Unit

The Si-Flo Flush Valve piston unit, noted for its long-wearing qualities, contains no metal to metal wearing parts. It can be replaced in five minutes at a nominal cost

K-1100—Si-Flo Seat Action Closet Flush Valve with 1-inch straight stop, flush connection for 1½-inch top supply, adjustable bar check-hinge, black hard rubber open-front seatless cover

K-7120-M SPEAKMAN Pop-up Lavatory Waste. Metal knob and metal escutcheon. 1¼-inch diameter tail

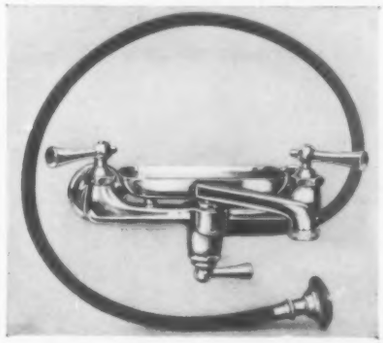
K-5504-M SPEAKMAN Grace-Line Sink Fixture. (Design patented.) With transfer valve, hose and spray head. ½-inch I. P. male connections. Center of inlets 8 inches. Adjustable threaded flanges, extra large and removable soap dish. Non-splash nozzle

Sink, Bath and Lavatory Fixtures

SPEAKMAN sink, bath and lavatory fixtures are designed to give the maximum of service. Every fixture is accurately machined and thorough tested under high water pressure. All valve parts subject to wear, including seats, are renewable. A swivel disc encasing the washer distributes wear on washer and seat. Monel metal washer-retaining screws are used because of their resistance to the corrosive action of certain types of water.

Institutional Catalog K-1

Send for our new Institutional Catalog K-1. It contains full information, including blueprint drawings and technical data on various types of Speakman Showers and Fixtures especially adapted for use in schools, colleges and institutions.



K-6790 SPEAKMAN Self-Closing Basin Faucet. Non-removable metal indexed push button. Non-hammering. Closes by both water and spring pressure. Nozzle 3¾ inches long with non-swirl stream regulator. Renewable working parts. ¼-inch threaded tail

K-5503-M SPEAKMAN Grace-Line Sink Fixture. Same as K-5504-M but less transfer valve, hose and spray head

STREAMLINE PIPE AND FITTINGS DIVISION

MUELLER BRASS CO.

Port Huron, Michigan

PROTECT THE INVESTMENT FOR THE LIFE OF THE BUILDING WITH ENDURING COPPER AND BRONZE

STREAMLINE bronze solder fittings and copper pipe are a radical departure in conducting systems for plumbing, heating or industrial use. Their unique method of connection has made it possible to use copper piping of hard temper and of a sufficient wall thickness to meet all requirements of actual service. This is in direct contrast to threaded copper pipe, which had to carry a very heavy wall to insure a sufficient thickness to meet service conditions after this thickness had been cut away approximately 50% in the fabrication of the thread. Threaded copper pipe for this reason is naturally very expensive and gives no extra service for its additional wall thickness on the unthreaded portion.

Streamline Solder Fittings are manufactured under U. S. Patents 1,770,852; 1,776,502; and 1,890,998

Illustrated Mechanical Features of the Streamline Fitting

STREAMLINE solder fittings and copper pipe are installed at a price very slightly in advance of rustable materials.

STREAMLINE fittings and copper pipe are ideal for use in all types of educational buildings for all general plumbing and heating purposes: for steam supply, condensate return, cold water, drinking water supply and return, and hot water supply and return piping. Among the many advantages are:

No rusting or clogging—No discoloration of water from scale or rust, nor any decrease in volume or pressure such as is invariably found after a few years with corrodible materials.

Light Weight, yet great strength—The STREAMLINE solder fitting, less heavy and consequently less expensive for any given size, produces a connection that is enormously strong and leakproof.

Minimum space required—Although STREAMLINE solder fittings produce enormously strong joints, they are very little larger than the pipe lines which they connect. They do not protrude like screw type fittings. Since these fittings are not screwed into place when connected to the pipe and no space is required for wrench handling, etc., they can be installed very close to each other, thus saving considerable space.

Leaks due to vibration eliminated—Constant vibration has no effect on a joint made with STREAMLINE solder fittings. Its effects are not localized as is the case with screw type fittings, but are harmlessly dissipated throughout the system.

Visual proof an exclusive feature of the Streamline Fitting.—When the mechanic installs STREAMLINE he can tell at a glance that the joint he has made is permanently leakproof without an actual pressure test. This is a valuable asset especially in concealed work.

The STREAMLINE solder fitting is not connected by threading or flaring but by soldering, utilizing one of nature's laws—capillary attraction—to form a permanently tight joint of great strength. The joint, in contrast to threaded connections, is actually reinforced and is the strongest point in the line, instead of the weakest.

Cut-away Sectional View of STREAMLINE Tee. Note How Pipe Is Recessed Into the Fitting, Resulting in a Uniform Smooth Waterway

The illustration herewith shows the mechanical features of the STREAMLINE solder fitting. After the joint has been fluxed and assembled in the pipe, it is heated and solder introduced through the feed hole. Capillarity immediately distributes it thoroughly and evenly between the bonding surfaces, producing a joint so strong that in a pulling test, the pipe will actually break while the joint remains without the slightest damage. It requires over 9000 pounds of pull even before the fracture in the pipe occurs. This, of course, is away beyond anything required of it in actual service.

ESPECIALLY RECOMMENDED FOR HEATING PLANTS

STREAMLINE hard copper pipe and fittings are particularly recommended for all heating plants—**THE AMERICAN SCHOOL AND UNIVERSITY** whether by hot water or steam—a special virtue of copper pipe being its capacity to hold heat with a minimum of radiation, yet to conduct it very rapidly, so that there is a minimum loss of heat when being conveyed from the point of generation to the points of distribution. Since copper cannot rust, the original delivering capacity of STREAMLINE pipe remains the same indefinitely. In all heating plants, we claim greatly increased benefits in all installations made with STREAMLINE, with noteworthy savings in both fuel and material.

STREAMLINE pipe and fittings are installed in over four hundred schools and colleges throughout the United States and, in fact, in every type of building construction. They have been specified by leading architects everywhere.

STREAMLINE fittings are furnished in complete range from ¼" to 10".

The word STREAMLINE is the Registered Trade Mark of the Mueller Brass Co., Port Huron, Michigan

Write for Catalog F.

AMERICAN ABRASIVE METALS CO.

FERALUN—BRONZALUN—ALUMALUN—NICALUN

Names Reg. U. S. Pat. Off.

Irvington, N. J.

New York Office: 50 Church Street
Chicago Office: 111 W. Washington Street

AGENTS IN

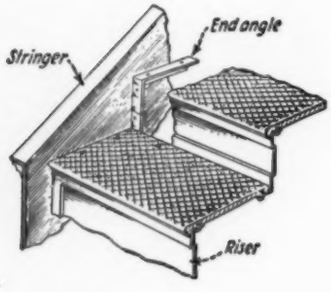
BOSTON: 137 Newbury Street
ST. LOUIS: Louderman Building
LOS ANGELES: 2701 Laura Avenue
PHILADELPHIA: 1700 Walnut Street
PITTSBURGH: 2101 Farmers Bank Building
SAN FRANCISCO: 405 Call Building
AND OTHER PRINCIPAL CITIES

Hatch Surface

SAFE STAIRWAYS PREVENT ACCIDENTS
USE
FERALUN Anti-Slip Treads

Plain Surface

FOR NEW STAIRWAYS



This STRUCTURAL TREAD has been especially designed for school installations. It affords the most economical and generally satisfactory method of insuring safe stairways permanently anti-slip.

FOR REPAIRING WORN STAIRWAYS

This SUPERIMPOSED TREAD is widely used for the repair of worn stairs. Repairs so made are inexpensive and permanent. These treads can be superimposed on any existing wood, cement, iron, marble or slate stairs.

Write for catalogue showing our complete line of styles and their applications

FERALUN, BRONZALUN, ALUMALUN and NICALUN are anti-slip abrasive castings, each trade name indicating respectively the metal used as a matrix. Grains of the hardest known electric furnace abrasive product are incorporated in the wearing surface of the castings to provide maximum wear and anti-slip qualities. Special care is used to see that the abrasive grains are carried over the nosing edge, the point of greatest hazard.

SPECIFY OUR PRODUCTS AND BE SURE

THE AMERICAN SCHOOL AND UNIVERSITY

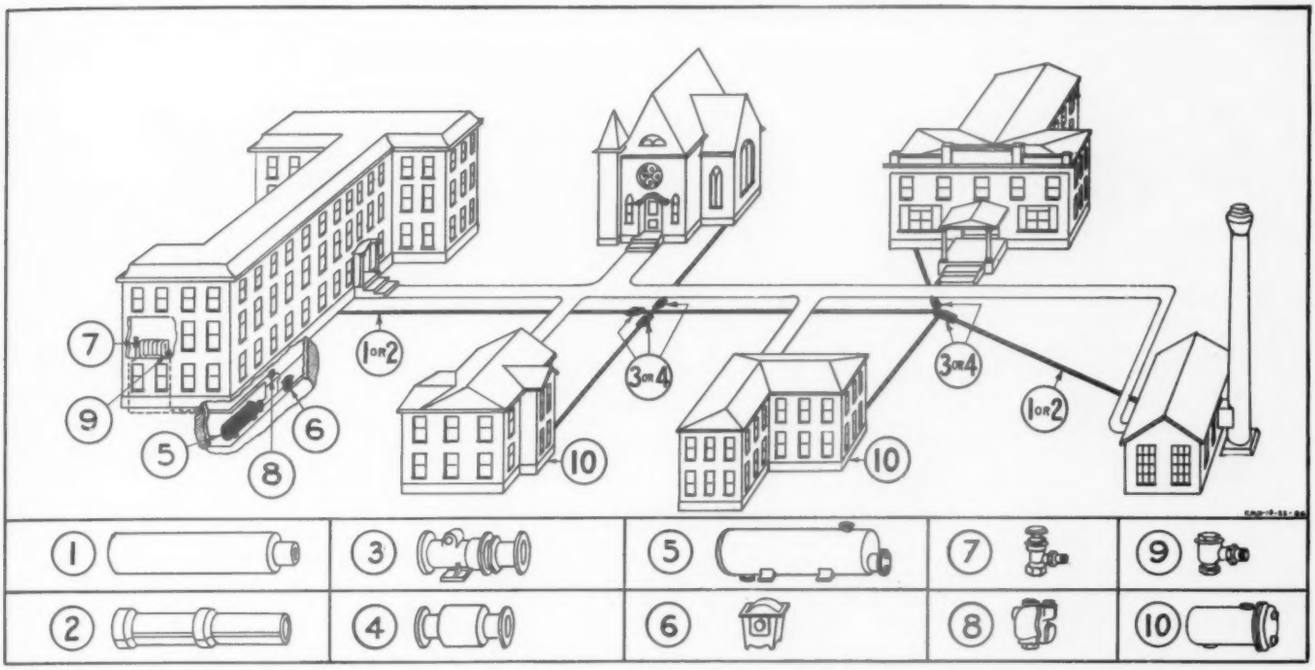
AMERICAN DISTRICT STEAM COMPANY

OVER FIFTY YEARS IN BUSINESS

Manufacturers of Steam Distribution Equipment

North Tonawanda, N. Y.

BRANCHES AND AGENTS IN PRINCIPAL CITIES



How the Originators of District Steam Heating Can Help You with Your Campus Heating Problems

The typical campus layout above, with all buildings served by a district steam heating system from a single boiler plant, illustrates the major products of the American District Steam Company and shows where they are used on the heating system.

ADSCO products are the result of over 50 years' practical experience in steam distribution by the originators of district steam heating. ADSCO steam distribution equipment is in use on the heating systems of many prominent schools, colleges and universities from coast to coast. A partial list of such institutions using ADSCO products is given at the right.

Correspondence is invited from school executives in charge of heating regarding district steam heating and ADSCO products. ADSCO engineers can make recommendations for the solution of your heating problems based on your individual operating conditions.

WRITE FOR ADSCO CATALOG NO. 35A

The complete line of ADSCO products, including slip type and packless expansion joints, underground steam line conduit, condensation and steam flow meters, steam traps, water heaters, radiator valves, traps and other vapor heating specialties, is illustrated and described in detail in the latest ADSCO Catalog No. 35A. Write on your letterhead for your copy today and it will be sent promptly, without obligation.

1. ADSCO-Red Diamond Brand Wood casing
2. ADSCO-Bannon Tile Conduit
3. ADSCO Slip Type Expansion Joint
4. ADSCO Packless Expansion Joint, U-Ring Type
5. ADSCO Storage Water Heater
6. ADSCO Rotary Condensation Meter
7. ADSCO Packless Graduated Radiator Valve
8. ADSCO Vertical Steam Trap
9. ADSCO Radiator Trap
10. ADSCO Instantaneous Water Heater

PARTIAL LIST OF USERS OF ADSCO PRODUCTS IN THE SCHOOL AND UNIVERSITY FIELD

American University
Alfred University
Arkansas State College
Barnard College
Bucknell University
Carleton College
Columbia University
Conn. State College
Cornell University
Harvard University
Howard University
Iowa State Teachers College
Juniata College
Michigan State College
Middlebury College
Monmouth College
N. J. State Teachers College
Pa. State Teachers College
Pennsylvania State College
St. Bonaventure College
State College of Wash.
State Univ. of Iowa
Syracuse University
Temple University
Tufts College
Union College
University of Arizona
University of Dayton
University of Florida
University of Maryland
University of Minnesota
University of Montana
University of North Carolina
University of Pittsburgh
University of Rochester
University of Tennessee
University of Texas
University of Toronto
University of W. Virginia
University of Wisconsin
University of Wyoming
University of Utah
Vassar College
Wellesley College
Williams College

AMERICAN MASON SAFETY TREAD CO.

GENERAL OFFICE AND FACTORY
Lowell, Mass.

PREVENT ACCIDENTS WITH AMERICAN MASON SAFETY TREADS

American Mason Safety Treads provide almost complete immunity from slipping. In addition, they insure greater durability for stairs of any type. They are especially desirable for stairs in school buildings wherever the traffic is heavy, for thresholds of doors, and for ramps and floors around heavy machinery in school shops. Suitable for use on granite, marble, slate, cement, iron or wood—new or old construction—they are especially desirable on concrete stairs, as they prevent the raw edge from chipping off.

REPAIR WORN STAIRS WITH AMERICAN MASON SAFETY TREADS

For repairing purposes, Mason Safety Tread is ideal. The worn portion of the stair is built up to the level with Karbolith or cement filling, on which is placed the Safety Tread. Steel, Brass or Aluminum Nosings may be attached to the Safety Tread for attractive finish or to cover up the filling on badly worn stairs.

Our long experience enables us to give directions for the repair of any stairway, of any material and any degree of wear. We will furnish without obligation suggestions, sketches or blueprints, showing just how the work can best be accomplished and at the lowest cost.

A SAFETY TREAD OF ABRASIVE METAL

Above is shown a special cast metal type of American Mason Safety Tread, in which aluminous abrasive has been embedded in the wearing surface of the molten metal. The flint-like particles of the abrasive project above the surface, which effectively prevents slipping, whether wet or dry. The treads can be furnished in three surfaces—fluted, diamond-hatched as above, or plain. The body metal may be of iron, bronze, aluminum or nickel, dependent upon the type of service for which the tread is intended or the architectural effect desired. Certain styles require no subtread and can be used with or without a riser. These treads are easily and quickly installed on either new or old work.

MASON ROLLED STEEL OR EXTRUDED BRASS DOOR SADDLES

These are recommended wherever appearance and protection against wear and slipping are desired. Door Saddles are furnished with corrugated surface as illustrated, cut to required length, drilled and countersunk for screws.

Before Repairing

After Repairing

Write for a copy of our illustrated booklet and the name of our nearest agent

ARCH ROOF CONSTRUCTION CO., INC.

Engineers and Contractors

Telephone
CHickering 4–3516

55 West 42nd Street, New York, N. Y.

DISTRICT ENGINEERS

Chicago, Ill., R. H. Finley, 9 So. Clinton St. [Tel.: Dearborn 7918]
Cleveland, Ohio, The Carver-Behan Co., 1740 E. 12th St.
Los Angeles, Cal., Bert E. Anderson, 9129 W. Adams St.
San Francisco, Cal., Rolph, Mills & Co., Rialto Building

LONG SPAN ROOF ARCHES

Swarthmore College Field House
Walter T. Karcher and Livingston Smith, Architects

Scope of Application and Service

Design, Construction and Erection of Long Span Roof Arches for field buildings; theaters; auditoriums; convention, exhibition and fair buildings; gymnasiums; skating rinks, and all buildings where unobstructed space, maximum light and ventilation are desired, and with or without balconies.

Arch Roof Construction Co., Inc., will design arches, supply all materials and do the erection, or ordinary materials can be supplied and erection done by local contractors.

Field Buildings

Our field or sports buildings can be erected for use as auditorium, theater, gymnasium, ice hockey, baseball and football, etc. These buildings are easily interchangeable (without structural changes) permitting daily varied uses of one efficient building instead of requiring several infrequently used buildings.

Spans to Over 400 Feet

We use short lengths of the usual structural materials in the design and economical construction of buildings havings spans up to **400 feet** or more, where unobstructed space (no columns, posts or trusses) is desired. Heights to suit.

Strength

Arch roof construction can be of timber or steel or a combination of both. Standard structural shapes and sizes are employed in a patented design with patented connections to produce a roof of unusual strength. It may be fireproof, fire-retardant or non-fireproof.

Design

All our arches are scientifically designed as hingeless, one, two, or three-hinged arches, and any competent structural engineer can design and check our arches.

In our design, ample provision is always made for all dead, live and unbalanced loads, rib shortening, temperature variation, etc.

Advisory Service

We will gladly provide information and suggestions to school officials, architects, and engineers on the most economical and efficient designs for these buildings. A request will bring additional information.

United States Patents

1,480,882, January 15, 1924
1,639,930, August 23, 1927
1,783,958, December 9, 1930
1,795,331, March 10, 1931
1,891,346, December 20, 1932
2,021,480, November 19, 1935
2,031,937, February 25, 1936

Other Patents Pending

Canadian Patents

329,165, January 10, 1933
331,206, March 28, 1933

Great Britain Patents

382,138, January 18, 1932

BOLGER-HELLER SLATE CO.

Quarriers and Manufacturers

Bangor, Pa.

SALES REPRESENTATIVES IN THE PRINCIPAL CITIES

GENUINE

REG. U. S. PAT. OFF.
Paramount
ALBION-BANGOR

SLATE

PRODUCTS

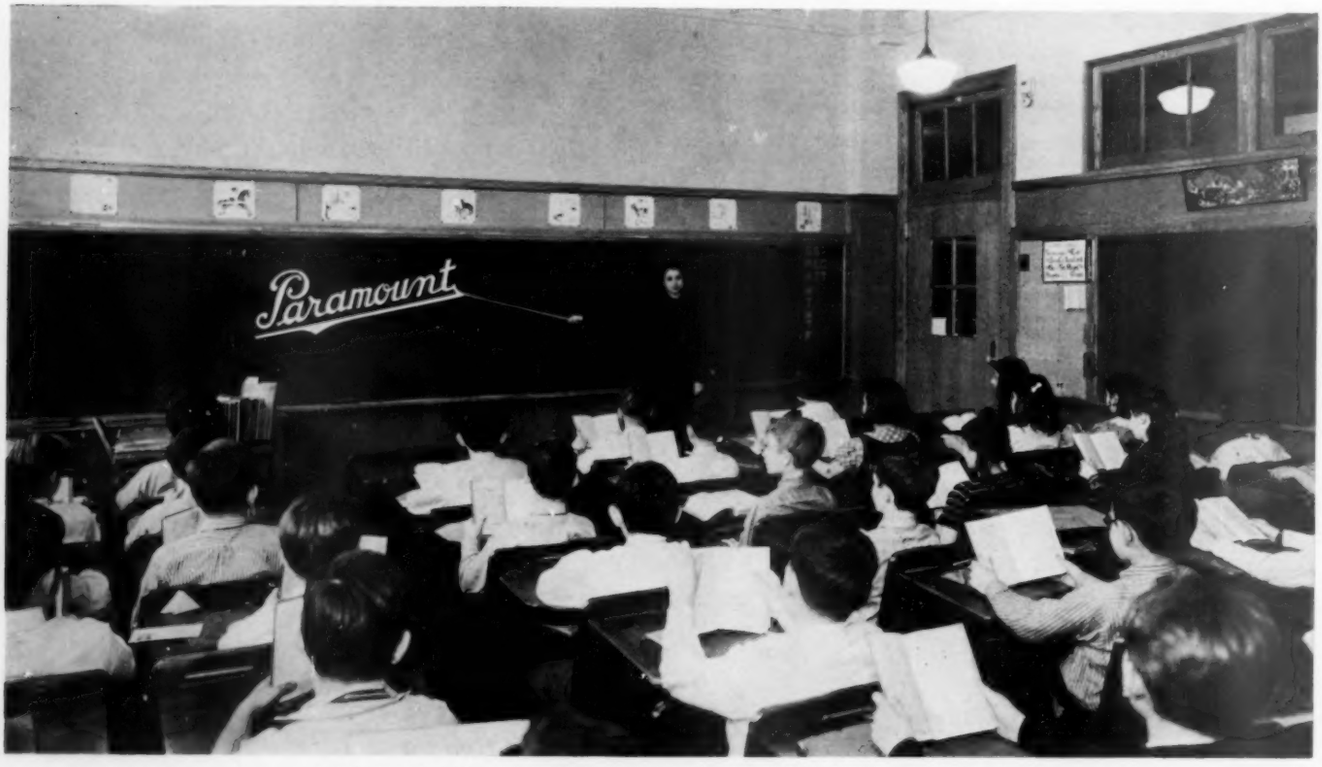
Blackboards	**Stair Treads**
Roofing Slate	**Toilet Enclosures**
Shower Stalls	**Wainscoting**

And structural slate for all requirements

PARAMOUNT VELVET FINISH SLATE BLACKBOARDS

All slate designed for blackboards is subjected to rigid inspection and only clear blemish-free stock is used. This selected slate is polished by machine until it is entirely free of sand pits and of any surface irregularity. The level surface is then gone over carefully by hand. It is this final hand rub that produces the Paramount Velvet Finish—a writing surface of permanent satisfaction.

Facilities: Our quarries and reserve stock are adequate for all demands. Whatever your slate requirements, we invite you to avail yourself of our consulting service.



A Recent Installation of Paramount Slate Blackboards in a Public School, Brooklyn, N. Y.

THE BARRETT COMPANY

Manufacturers of Roofing Materials

40 Rector Street, New York, N. Y.

2800 So. Sacramento Avenue
Chicago, Illinois

Birmingham
Alabama

PRODUCTS

Roofing Materials—For Flat Surfaces: Barrett Specification Pitch and Felt Roofs, Black Diamond Pitch and Felt Roofs.

For Steep Surfaces: Barrett Steep Roof Pitch and Felt Roofs, Anchor Asphalt and S.I.S. Roofing. Barrett Asphalt Shingles and Roll Roofings.

Miscellaneous — Waterproofing for foundations, swimming pools, tunnels, floors, etc., special specifications submitted. Insulating and Building Papers, for sheathing, lining, etc. Dampproofing and Preservative Paints, Wood Preservatives. Tarvia-lithic for playground surfacing, roadways, paths and tennis courts.

For complete information about these and other products, write The Barrett Company, 40 Rector Street, New York City.

THE GREATEST NAME IN ROOFING

It is significant that Barrett Specification Roofs protect thousands of the finest school buildings in a nation that is particularly careful of its children. No other roof, it seems, so completely satisfies the exacting requirements for school roof construction.

To school and university executives the proved fire-safety of these famous roofs is of even greater importance than their long-run economy for taxpayers or their conservation of income in the case of privately endowed schools and universities.

Barrett Specification Roofs carry Class A—base rating by the National Board of Fire Underwriters. Their slag or gravel surface is immune to fire hazard caused by flying sparks and embers. Bonded for 20 years against repair and maintenance expense, Barrett Specification Roofs regularly last two or three times the term of their bonds.

Barrett Specification Roofs are applied by Barrett Approved Roofers, who are selected on the basis of their experience, ability and integrity. For the nearest Barrett Approved Roofer consult the Classified Telephone Directory under "Roofers." Consult with him or with us on any roofing or waterproofing problem.

FREE ROOF INSPECTION

For many years, The Barrett Company has offered building owners an unique service that has been the means of saving many thousands of dollars in upkeep expenses. On request, a Barrett Roof Inspector will make a careful survey of your roofs, flashings, copings, parapets, etc., and render a complete unbiased report. This service is free on buildings with roof areas of 5,000 square feet and up, located east of the Rockies.

Barrett Specification Roofs

Payne Whitney Gymnasium, Yale University, New Haven, Connecticut, is protected with 60,000 square feet of Barrett Specification Roofs. Arch.: John Russell Pope. Gen'l Cont.: Marc Eidlitz & Son, Inc. Barrett Approved Roofer: The New York Roofing Company. All of New York City

CAPITAL ELEVATOR & MANUFACTURING CO.

Manufacturers of Electric and Hand Operated Ash Handling Equipment

Town and Lucas Streets, Columbus, Ohio

REPRESENTATIVES

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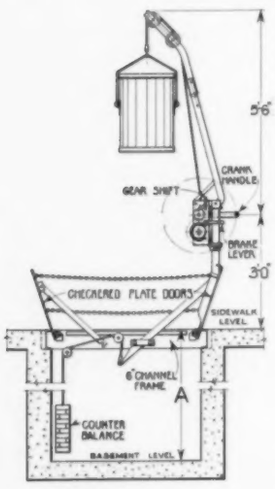
CHICAGO, ILL., Elevator Equipment Co., 162 No. Desplaines St.
CINCINNATI, OHIO, Central Building Products Co., 626 Broadway
CLEVELAND, OHIO, C. M. Wilkinson Co., 806 Keith Bldg.
DETROIT, MICH., Square Deal Elevator Co., 320 Beaubien St.
LANSING, MICH., Jas. E. Payne, 410 W. Saginaw St.
LOUISVILLE, KY., Champion Wire & Iron Works
NEW YORK, N. Y., A. W. Berghoefer, 122 E. 42nd St.
PITTSBURGH, PA., W. R. Rees Elevator Co., 17 Third Ave.
PORTSMOUTH, OHIO, Earl C. Hayes & Co., Box 908
RICHMOND, VA., R. E. Edmister, R. R. No. 6
ROCHESTER, N. Y., Alvin V. Light, 371 Hurstbourne Rd.
SANDUSKY, OHIO, J. W. Keller, Box 753
SUPERIOR, WIS., F. E. Johnson, 709 E. 8th St.
WICHITA, KAN., Chester L. Anderson Co., Box 1143

HAND POWER MAST TYPE CAN LIFTS — MODEL 18



Side View

Model 18 (Disappearing Folding Mast Type)

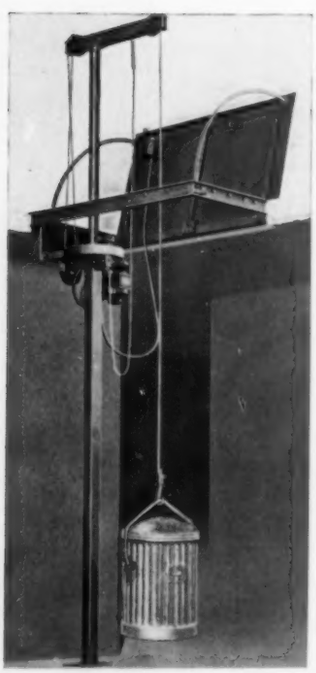
Built as part of a flush type sidewalk door with hoist, frame and door shipped assembled, ready to cement in place. All erection expense is thus virtually eliminated.

The operator opens balanced doors, unfolds the mast into place and readily raises our No. 2 heavy galvanized corrugated swing bail ash cans 18 in. in diam. by 26 in. high, filled.

Winch has ball bearings with cut gears, has ratchet for holding load and gear shift and brake for lowering empties. Rugged and easily operated.

Made in one size only. No engineering data required unless basement depth exceeds 15 ft. when extra cable will be furnished. Standard size sidewalk doors 3 ft. x 4 ft.

Model 18 Disappearing Folding Mast Can Lift



Model 19 Disappearing Screw Mast Can Lift

An inexpensive power driven outfit for schools, stores, apartments, hospitals, etc.

ELECTRIC DISAPPEARING MAST CAN LIFT — MODEL 19

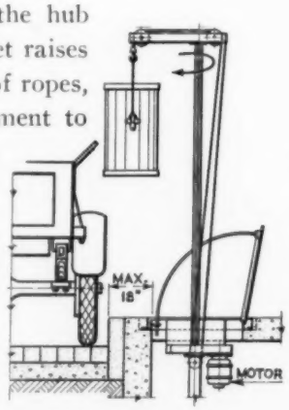
This model is an inexpensive power driven outfit for the limited amount of ashes from schools, stores, apartments, hospitals, etc., for delivery from basement up through sidewalk door to truck. Its ⅓ hp. motor operates from a light or power circuit. Lifts a filled can of about 165 lb. at approximately 35 ft. per minute. Fits basements 7 to 17 ft. deep.

From grade level to bucket hook, 7 ft.

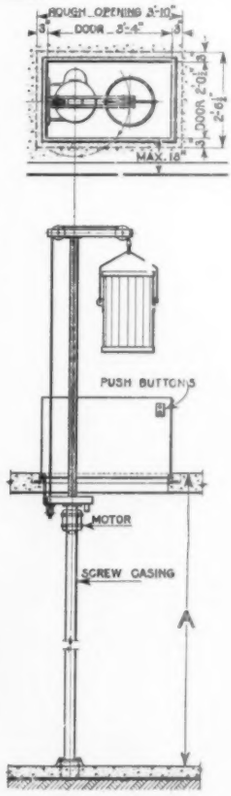
Its screw mast travels through the hub of a motor driven gear, as the bucket raises and lowers. Thus, by arrangement of ropes, the bucket is raised from the basement to truck while the screw travels above grade level.

Operation — Open sidewalk door; use "Up" and "Down" switch placed there for full control of lift. Automatic switches fix limits of travel.

Ordering — In making inquiry, give basement depth "A" and electric current available.



Cans Readily Swing to Trucks



THE PHILIP CAREY COMPANY

Manufacturers of

Roofing and Waterproofing Products, Heat Insulations

Lockland, Cincinnati, Ohio

The roof of a school building represents little more than 1% of the total construction cost yet on its durability and weather-resisting qualities depend the protection of the other 99%. The school roof should be designed and built to last the life of the building. Re-roofing is an expense that need not be incurred under ordinary conditions if the right roof is selected and properly constructed.

SPECIFY

Carey ROOFS

FOR LASTING PROTECTION

Carey Roofs meet every requirement for modern school construction. For more than sixty years Carey Roofs have been specified for important public buildings throughout the United States, and their application to new school construction is increasing year by year because they have proved their durability and lasting protection against weather.

The quality of materials entering into Carey Built-Up Specifications are carefully checked by our engineering department and research laboratory, allowing a liberal factor of safety as to tensile strength, number of plies and thickness of plies, to assure adequate and permanent weatherproof protection.

FREE ROOF SURVEY

The Carey Roof Survey Plan has been in operation for several years and has been the means of cutting roofing upkeep expense to a minimum. Without obligation on your part, a Carey Inspector will make a careful survey of your roofs, flashings, parapets, etc., and give an honest and impartial report on their condition.

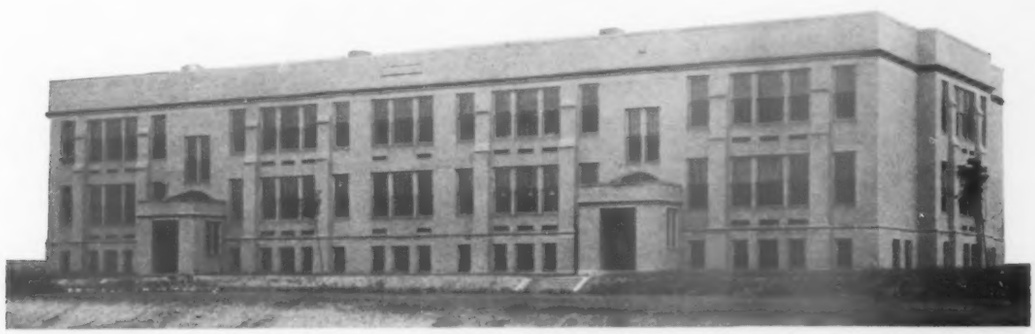
Carey Asfaltslate Shingles represent the standard of quality in composition shingles. They are built especially rugged and substantial to give extra years of trouble free service. They are proof against all ordinary fire risks and need no paint or other upkeep expense. Be sure to see the Carey Cork Insulated Shingle which is constructed to provide roof insulation that is automatically applied at the same time the roof is put on.

Careystone Asbestos Cement Shingles. Made of asbestos and cement, it provides a permanent roof possessing natural properties that enable it to resist the destructive influences of time, weather and fire.

Carey Heat Insulations. For low pressure steam or hot water heating systems, Careycel Pipe Covering has no equal. It combines high insulating efficiency with low cost. The Carey Heat Insulation Line is complete. A special insulation material to meet every service condition. Temperature ranges from zero to 2500° F.

Carey Waterproofing Materials. Carey waterproofing product for basement walls and swimming pools; Protective coatings to repair leaks and prolong the life of all types of roofs, protection paints for hot and cold metal surfaces.

For complete information on Carey Roofs and other products, write The Philip Carey Company, Lockland, Ohio.

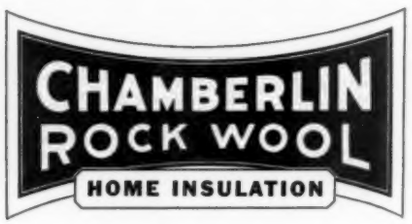


CHAMBERLIN METAL WEATHER STRIP CO.

1453 LaBrosse St., Detroit, Michigan

4 WAYS TO SAVE HEATING DOLLARS

1 Chamberlin Weather Strips will save 10 to 20% of your heat bill but in proportion to cost they will save more fuel dollars than anything else you can do to save heat. And school attendance will improve because you will stop 80% of the drafts which endanger the health of children seated near windows. Chamberlin Weather Strips are made of zinc, brass or bronze to last a life time and they fit any type of window and door, wood or metal. Let us give you the name of the school near you where Chamberlin Weather Strips are cutting costs and saving heating dollars.



2 If your school has hollow frame or veneer wall construction much of your heat is lost unless walls and roofs are insulated with Chamberlin Rock Wool. It's something like sheeps-wool, spun from pure stone into light, fluffy, silken fibers which cannot burn. It's the perfect insulator because it keeps 30 to 40% of the heat where it belongs—inside in the winter and outside in the summer, and many a serious fire has been prevented when Chamberlin Rock Wool was on the job to choke its spread. What's more it is blown by a powerful machine through a large rubber hose and there isn't a hole or nook that can't be filled, whether your school is old or new.

3 Chamberlin Plasti-Calk is needed to fill the cracks between window frames and wall construction. Why? To keep dampness from getting in behind where it will rust or rot the frame; to stop air leaks and to keep out the dust and soot that settles on inside walls. Examine the mortar joints in your school and look for signs of crumbling—a sure sign of rapid disintegration that should be stopped at once. For these and many other similar conditions Chamberlin Plasti-Calk is the only remedy. It's a tough, plastic, weather-proof, non-staining, colored, putty-like compound. If you have leaks at eaves, in roofs and ceilings that are hard to find it is quite possible that Chamberlin Plasti-Calk will solve the problem when mortar joints are sealed with Chamberlin Plasti-Calk.

4 Chamberlin Weather Strips and Rock Wool together stop 60 to 70% of the heat losses that can be saved. One substantial heat loss still remains, however—and it takes place through window glass. There is one practical way of stopping that—"insulate" your windows with an air-space by adding Chamberlin Insulate Windows. They are designed to do the job without being easily seen; they can be opened and cleaned with ease and your ordinary windows operate just the same. Write for booklets on all four types of Chamberlin money-saving, heat-saving "insulation" equipment. Chamberlin factory branches from coast to coast furnish estimates and do the work. Special financing arrangements to suit your requirements.

COLUMBUS COATED FABRICS CORP.

Columbus, Ohio

BONTEX
IMPREGNATED PYROXYLIN . . . GUARANTEED
WASHABLE SHADE CLOTH
Columbus Coated Fabrics Corporation

Bontex is a pyroxylin impregnated shade cloth. It is washable and colorfast. It can be scrubbed over and over again without harm. It does not fray, pinhole, or crack under long, hard usage. Bontex Shade Cloth (translucent, semi-opaque, and opaque) is obtainable in a wide range of plain colors and beautiful designs.

BECAUSE Bontex Shade Cloth has demonstrated its special fitness for school-room needs, it is used in many of the finest schools in America. Consider—for your school—the many excellent features of Bontex for better, longer service and true economy.

Long Service. Bontex shade cloth is pyroxylin-impregnated to withstand long, hard usage. It is guaranteed sunproof and colorfast. It does not fray, pinhole, or crack. It is built to endure beating sun, wind and rain and to resist the wear and tear of everyday handling. Bontex shades keep their fresh new beauty for years. When dirty they can be scrubbed clean with soap and hot water. Scrubbing 20 times or more does not impair the quality or dull the original fine finish and coloring of Bontex.

Better Light With Bontex. Bontex shade cloth is an important factor in the correct lighting of rooms. Even when shades are drawn, light enters the room through the translucent and semi-opaque Bontex shades—soft, diffused light, without glare. The result is less eye-strain, fewer headaches, better school work.

Known Quality and Dependability. Bontex shade cloth conforms to government specifications CCC-C-521 and DDD-S-251 and its quality is guaranteed by the government label. The dependability of Bontex has also been proved by the Delineator and Lux laboratories, and by the South Florida Test Service, demonstrating that it withstands repeated scrubbings, is sunproof and colorfast.

Bontex Economy. Bontex shade cloth is not expensive. Its first cost is but slightly higher than ordinary shade cloth which lasts only a fraction as long.

For Every Purpose. Bontex shade cloth—translucent, semi-opaque, and opaque—is available in 12 plain colors, 5 beautiful corded designs, 5 Duplex colors, and 5 modern printed patterns. Write to COLUMBUS for sample book and complete information on Bontex Shade Cloth.

● *Bontex Shades are installed throughout in these schools. TOP PHOTO—The New Brooklyn Technical High School, Brooklyn, N. Y. LOWER LEFT—The New Bayside High School, Bayside, Long Island, N. Y. LOWER RIGHT— Bexley High School, Bexley, Ohio.*

CORK INSULATION COMPANY, INC.

155 East 44th Street, New York, N. Y.

FACTORY: Wilmington, Delaware

BRANCHES

Boston, Mass.
*Chicago, Ill.
Los Angeles, Calif.
Philadelphia, Pa.
San Francisco, Calif.
Seattle, Wash.
St. Louis, Mo.
Washington, D. C.

* Represented by Corinco Insulation Co., Inc.

CORINCO CORK TILE FLOORING
MONTHLY MAINTENANCE NO LONGER NECESSARY

FOR a year now we have been working toward the manufacture of a "perfect" cork tile floor, and toward the elimination of the nuisance of having to service the floor every two weeks or every month with constant waxing. We have accomplished all this and now present the complete flooring unit to you.

A tile that will outlast any resilient floor and most non-resilient floors at present on the market; CORINCO CORK TILE.

A cement (CORINCO ADHESIVE), that keeps the tile down once it is set. (We have a waterproof cement also if the job requires that—CORINCO WATERPROOF CEMENT.)

A finish that requires no servicing whatever, no matter what type of floor it is on, beyond cold water and a mop, and which will wear indefinitely under ordinary traffic conditions. Easy to apply and takes less than an hour to dry. One application a year, even under severe conditions, is more than enough.

Specify—

Corinco Heavy Density Cork Tile
Corinco Adhesive
Corinco Permanent Finish

CORINCO ACOUSTICATOR
SOUND ABSORBENT—SOUND PROOFING—VIBRATION ABSORBENT

Is even used by boat builders to absorb the sound and insulate from the vibrations emanating from the engine, the most severe test you could put an acoustic material to. Actually **absorbs** the sound, does not just bottle it up. Has practically no affinity for water and no capillary action. The last word for this type of treatment—plain or bevelled and either painted or unpainted.

CORINCO INSULATION

Corinco Corkboard, nature's own insulation, has an enviable reputation already with those interested in insulation where the requirements are severe. It is nature's own development for just what we use it for: insulation. It is made of nothing but pure cork. Let it answer your insulating problems.

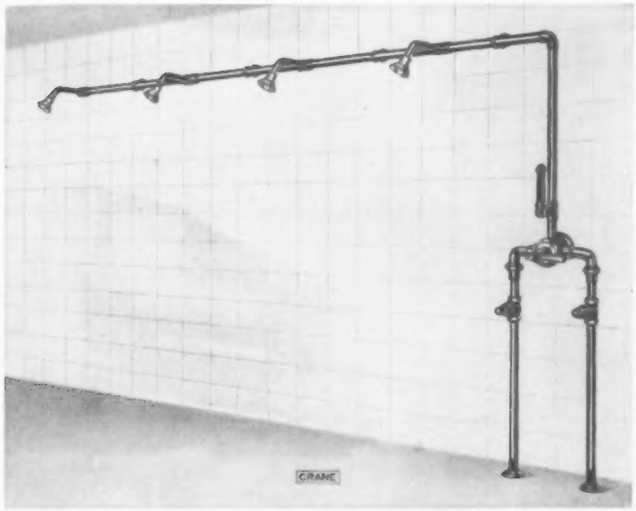
REMEMBER THE NAME—CORINCO

CRANE CO.

Valves, Fittings, Fabricated Pipe, Pumps, Plumbing and Heating Material

General Offices: 836 S. Michigan Ave., Chicago, Ill.

BRANCHES AND SALES OFFICES IN ONE HUNDRED AND SIXTY CITIES



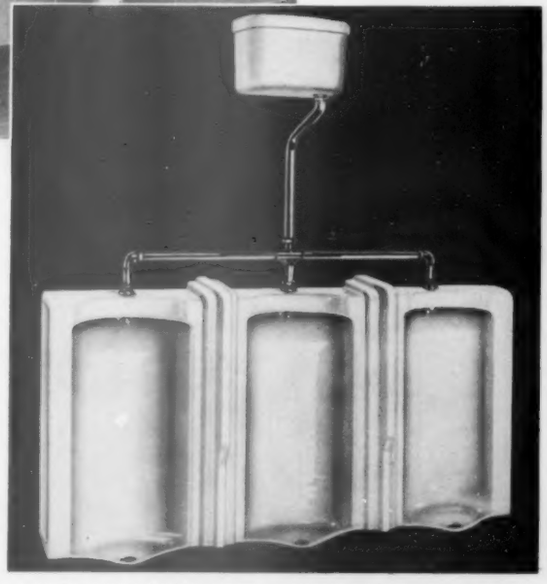
This Crane school shower system has Refreshor *easy-to-clean shower heads and a 6-inch cylindrical case angle thermometer*

Two main factors should govern the selection of sanitary equipment for school use: (1) Maximum protection from contamination and from the spread of water-borne diseases, and (2) durability and stamina to withstand the rigors of school service. Crane Co. offers a complete line of sanitary equipment—specially designed for school use—which embodies these prime requisites in the highest degree. In addition, Crane sanitary equipment for schools has the beauty and correctness of design which aid in building a better school environment. The completeness of the Crane line of school equipment enables you to supply all your needs from a single source—with single, undivided responsibility for your satisfaction. The illustrations on this page show typical Crane products in various classes. Write for the Crane School Catalog which gives complete information.

Made of durable, vitreous china, this Crane Norwich *Lavatory has the Improved* Triumph Jr. *self-closing faucets and the famous Lever-Action* Securo *quick-draining waste*

Scientifically designed for school use, only 13 inches from floor to rim, this Crane Lowall *Closet has the concealed* Delta *sea-operated flushing valve and hard rubber open front and back seat*

Spread of infectious diseases is minimized by this Crane Corwith *china wall drinking fountain. It has an automatic stream regulator to prevent waste of water*



Porcelain (all clay) construction, and separate extended intermediate shields fit these urinals for the modern school

The Crane Delta *Flush Valve has the* Vigilant *Vacuum Breaker which positively prevents contamination of supply lines*

The Crane Improved Triumph *Self-Closing Faucet is built for rugged service, long life and smooth, easy action. It reduces maintenance costs to the minimum*

DETROIT STEEL PRODUCTS COMPANY

2250 East Grand Boulevard, Detroit, Michigan

BRANCHES OR REPRESENTATIVES IN OVER 200 LEADING CITIES

Fenestra

Steel Windows for Schools

South Side High School, Rockville Center, L. I., N. Y.

Junior High School, Upper Darby, Pa.

Grosse Pointe High School, Grosse Pointe, Mich.

Valencia High School, Placentia, California

Ottawa Hills School, Toledo, Ohio

Fenestra Steel Windows are made in a wide variety of types and sizes especially designed for grade school and high school buildings, universities, libraries, museums, class rooms, gymnasiums, laboratories and offices.

The narrow, steel members, besides being fire resisting, permit a much larger glass area than ordinary windows thus making it easy to secure even more than the specified percentage of window area to floor area. Ventilators projecting out, do not swell, warp or stick in operation, provide protecting canopies over the openings, are easily screened on the inside where desired and provide an unobstructed inside surface for the attachment of shades, drapery or venetian blinds.

Window openings may be designed with any amount of ventilation up to 100%. With the Dalmo operating device, upper ventilators may be opened or closed by merely operating the lower ventilator as in the photograph of the Valencia High School. This feature is especially desirable in warm climates and in open air schools in every part of the country. Ventilators may be shaded individually.

Small glass lights (about 14″ x 20″) may be had where specified and materially reduce maintenance costs where the windows overlook playgrounds. If wire glass is used, outside guards become unnecessary.

These windows are invaluable in the admission of abundant light, so important for cheery, attractive interiors and the elimination of eye-strain.

The photographs,—center and left above, show how attractively Fenestra Windows may be installed in schools of Colonial design. Almost unlimited combinations are possible to fit any sized window opening or any architectural treatment.

Detroit Steel Products Company maintains 14 District Sales Offices, fully stocked warehouses at strategic points and competent agents in over 200 cities who will be glad to assist you on any school window problems.

THE ELECTRIC STORAGE BATTERY COMPANY

World's Largest Manufacturers of Storage Batteries for Every Purpose

Allegheny Avenue and Nineteenth Street, Philadelphia, Pa.

WHY

emergency lighting is necessary

Lighting Failures Do Happen—Storms, fires, street accidents, floods, blown fuses, short circuits—*all events which electric companies are helpless to foresee or prevent*—do cause electric lighting interruptions.

No Community or Building Immune—Electric service interruptions occur without warning, when least expected and where least wanted. An auditorium or gymnasium crowded with pupils at sports, plays, lectures or dances, is no place to gamble with the risks of fire, injury or damage which frequently attend sudden darkness.

Such Risks Unnecessary—Today, emergency lighting can be provided for the vital parts of any school building by installing Exide Keepalite. During an electric service interruption, Exide Keepalite furnishes the power from a dependable Exide Battery to the lights in auditoriums, gymnasiums, corridors, exits, fire towers, stairways, engine rooms, locker rooms, swimming pools, dormitories, laboratories, etc.

Automatic Protection—Exide Keepalite Emergency Lighting Battery Systems are completely automatic and instantaneous in operation.

A Battery System—Electrical engineers agree that a storage battery, *properly maintained*, constitutes the most dependable source of emergency power. Exide Keepalite Systems assure this form of protection at a maintenance cost as low as 1½¢ a day for power.

Exide Batteries have been used in emergency service, by telephone, railroad and public utility companies since 1895. The new Exide Keepalite control equipment, which automatically keeps the battery properly maintained, represents the specifications found desirable from the experience of more than 2000 installations in all kinds of buildings.

For Any Size Installation—In order to economically meet the widely varying requirements of individual school buildings, 115 volt and 12 volt Exide Keepalite Systems are available. The important electrical circuits of entire buildings can be protected with the larger 115 volt systems; or, parts of buildings can be adequately safeguarded with the specially designed low voltage Exide Keepalite Systems. Depending upon the amount of protection desired, Exide Keepalite Systems can be had for $150.00 and up.

A Typical Exide Keepalite System with a 60-cell Exide Battery and a 30 Amp. Control Unit. It Operates Instantly and Automatically. The Infrequent Addition of Water to the Battery Is the Only Maintenance Required

Exide Keepalite

EMERGENCY LIGHTING BATTERY SYSTEMS

How Keepalite Works

115 Volt System—This system provides all of the control apparatus necessary to: (1) automatically transfer the emergency circuits (regular building circuits) to the battery in a split-second—whenever normal electric service fails; (2) automatically return the emergency circuits to the normal electric supply—when it has been restored; (3) automatically recharge the battery; (4) automatically keep the battery charged at all times; and (5) automatically give an alarm if anything should go wrong with any part of the Exide Keepalite equipment.

12 Volt System—This system employs its own low voltage wiring circuits to the areas within a building needing protection. Through the use of special high-efficiency lamps (which give more than twice the lumins of ordinary electric bulbs) it provides adequate emergency lighting over floor areas, totaling 10,000 square feet. This equipment consists of especially designed apparatus to: (1) automatically provide emergency lighting in a split-second after an interruption of normal service; (2) automatically go off when normal service is restored; and (3) automatically place battery on trickle charge. However, provision is made that (a) the battery can be charged at a high rate by merely flipping a switch; and (b) the working order of the equipment can be tested by pushing a button. Thus it can be seen that only the minimum amount of attention is required. Any pupil could operate an Exide Keepalite low voltage system.

All smaller buildings, or parts of larger buildings, can be protected with the new, low cost equipment. However, in larger buildings where complete lighting protection is required, naturally the larger 115-volt Exide Keepalite System should be installed. The low voltage Exide Keepalite is not a substitute for the larger systems. It was designed to afford protection for areas limited to 10,000 square feet.

This $150.00 Exide Keepalite Protects Lights of Areas Up to 10,000 Sq. Ft. It Operates Instantly and Automatically

Superiority of Storage Battery Emergency Lighting Systems—Exide Batteries have long been used in not only emergency lighting service but also emergency power service. They safeguard the operation of railroad switches and signals, fire alarms, telephone, marine radio, industrial processes, etc.

Battery Life—More Than 10 Years—Exide Chloride Batteries used with Exide Keepalite Systems are good for 10 or more years of service.

THE ELECTRIC STORAGE BATTERY COMPANY offers the services of its trained Engineering Department to assist architects in the planning of a trouble-free Emergency Lighting System. We will be glad to send you complete descriptive literature and specifications for every type of Exide Keepalite Emergency Lighting Battery System.

Dependable Exide Laboratory Batteries available in any size, See page 473

ELKHART BRASS MFG. COMPANY

ESTABLISHED 1902

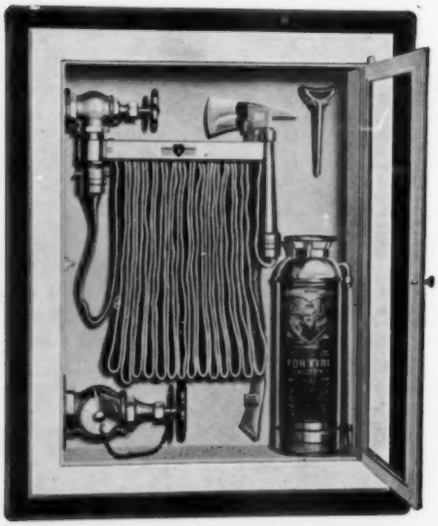
Manufacturers of Fire Protection Equipment

Elkhart, Indiana

PRODUCTS

Hose Cabinets of Bronze, Steel and White Metal.
Hose Racks of Brass and Steel.
Hose, Linen and Cotton Rubber Lined.
Valves, Couplings and Nozzles.
Extinguishers: Foam, Soda Acid and Carbon Tetrachloride.
Siamese and Hydrant Connections.
Spanners, Axes and all Complementary Equipment.
Garden Hose Equipment.
Hose Couplings and Fittings of all Kinds.
Brass Specialties.

STANDPIPE EQUIPMENT



Illustrating one of over 500 Units which we furnish regularly to the Building Industry. Send for Special Building Catalog.

APPROVED EXTINGUISHERS

Plate A Plate C Plate B

ELKHART EXTINGUISHERS

All Underwriters' Approved

Soda Acid — Anti-Freeze Pump Type
Foam — Automatic Anti-Freeze
Carbon Tetrachloride Dry Chemical Cabinets for all Extinguishers

THE COMPANY AND ITS FACILITIES

For thirty-five years the ELKHART BRASS MFG. COMPANY has been engaged in the development and manufacture of fire fighting equipment, fire extinguishers, hose fittings of all kinds, and garden hose equipment.

Representatives and jobbers are maintained in every section of the country. Inquiries sent direct to the home office will be handled with the utmost dispatch.

In addition to standard equipment, illustrated and described in our general Catalog F, special equipment is quickly available. With complete foundry and machine shop facilities under our own roof, we are prepared to deliver special items in a minimum of time, and with all the advantages of our thirty-five years' experience.

ALL TYPES OF HOSE COUPLINGS

Plate 383

High Pressure	Fire Hose
Steam Hose	Water Hose
Air Hose	Insulation Hose
Garden Hose	Cement Hose

EXTINGUISHER CABINETS

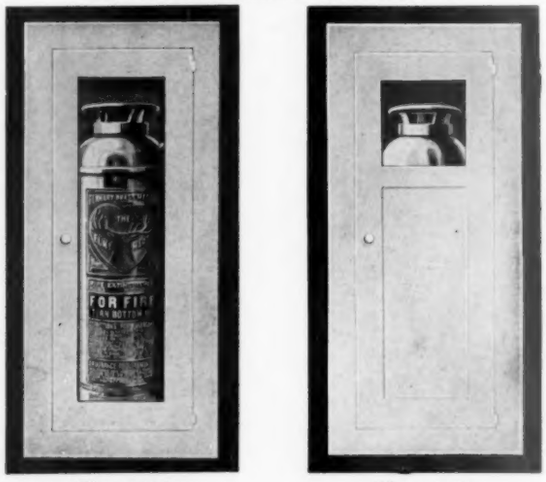


Plate 950
Plate glass panel

Plate 950
Style "D" panel

ELKHART, PLATE 950, EXTINGUISHER CABINETS

Steel cabinets, safely protecting and storing extinguishers, made of latest design hollow steel door and trim, friction catch, and concealed bronze hinges, now recommended by leading architects and engineers. Cabinets made to any specification. Send for blue prints.

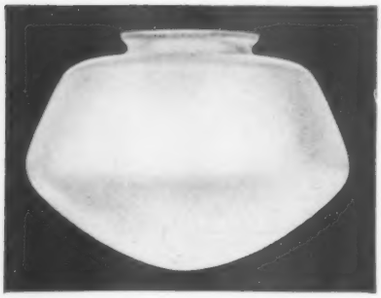
SEND FOR NEW GENERAL CATALOG F

GLEASON-TIEBOUT GLASS CO.

Manufacturers of
Lighting Glassware

Celestialite Division
200 Fifth Ave., N. Y. City

MAIN OFFICE
99 Commercial St.
Brooklyn, N. Y.



CELESTIALITE

Celestialite, the new "next-to-daylight" lighting glass for the modern school building, is a scientific combination of three layers of glass:

1. A layer of crystal clear transparency for body and strength
2. A layer of white glass, to diffuse the rays and soften the light
3. A layer of blue glass—to whiten and improve the quality of the light

Other Schools and Colleges Having CELESTIALITE Installations:

Amherst
Columbia
Princeton
University of Florida
Wells College
Wellesley
University of Texas
University of West Virginia
City of Boston Public Schools
City of Mount Vernon, N. Y.
City of Rochester, N. Y.
City of New York

LABORATORY REPORT

Subject

Report on CELESTIALITE AND OPAL GLASS (best type of commercial **unit** glassware)

To determine:

1. Relative visual acuity
2. Relative visibility
3. Relative eye comfort
4. Relative diffusion of light

Laboratory Findings:

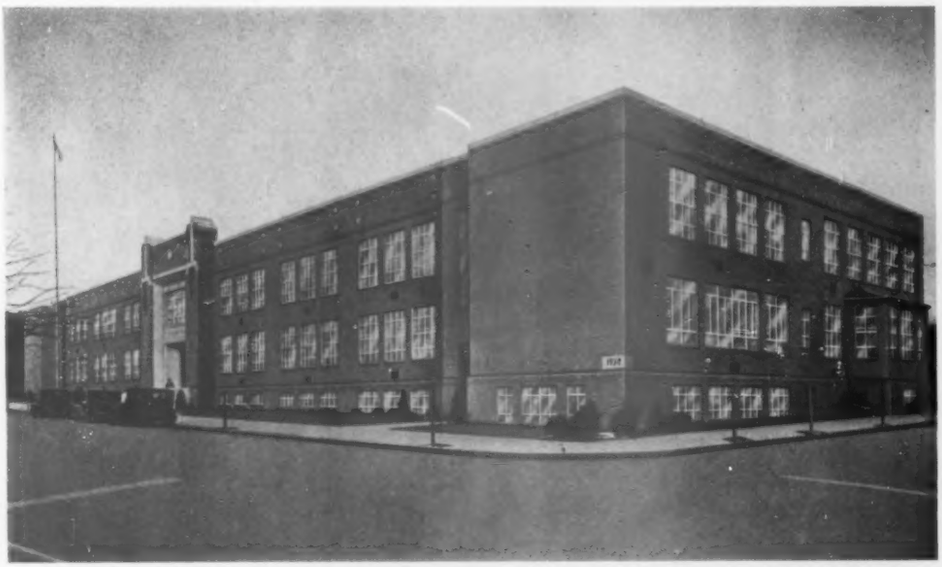
"The sample of Celestialite Glass sent for test transmitted 82 per cent as much light as the sample of Opal Glass.

"Equal visibility of the printed page was, however, obtained with only 80 per cent as much light of Celestialite quality as of the quality of the same source (Mazda lamps) transmitted through the Opal glass. Therefore, for the same intensity of source, the Celestialite glass gives slightly higher visibility than the Opal in spite of the fact that there is a higher foot-candle illumination with the Opal glass.

"Further, it took only 78-80 per cent as much illumination of Celestialite quality as of the Opal just to discriminate a detail of a given size. In addition, the Celestialite glass gives much greater comfort to the eye and much better diffusion of light than the Opal glass.

"It would seem, therefore, that the Celestialite glass gives an illumination which is superior to the Opal from the standpoints of visual acuity, visibility, eye comfort, and diffusion of light."

Signed: The Research Laboratory of Physiological Optics—Baltimore, Md.



Lighted with CELESTIALITE "Next-to-Daylight" Glass Throughout

Above is a picture of the Amanda E. Stout Grade School, of Reading, Pa.—the last word in modern school design—radio in every room—equipped with electric time signal and CELESTIALITE next-to-daylight lighting throughout.

This and Reading's Junior High School are but two of the outstanding schools of Reading that will be similarly equipped. Hundreds of schools and colleges, hospitals and institutions, are now CELESTIALITED.

There can be no better proof of the marked superiority of CELESTIALITE's lighting glass. Its soft "next-to-daylight" flood of light is easy on the students' eyes, and provides a cheery, wide-awake atmosphere that is an instant endorsement of CELESTIALITE's high lighting efficiency.

Every modern school or college building should be equipped with a modern lighting installation. Students and faculty both deserve the best lighting available. We shall be glad to send you complete information that will help you plan an effective lighting installation with CELESTIALITE Glass. We will also send you FREE a fragment of CELESTIALITE Glass, showing its patented three-layer construction.

THE GOODYEAR TIRE & RUBBER COMPANY, INC.

Akron, Ohio · · Los Angeles, Cal.

In building or remodeling, specify

GOODYEAR RUBBER FLOORING

to gain these 6 lasting advantages

1. **DURABILITY**—makes a "lifetime" floor that will probably never need replacing.
2. **CLEANLINESS**—impervious to dirt. A damp mop keeps it spotless.
3. **QUIET**—its resiliency assures maximum silence, as well as comfort underfoot.
4. **BEAUTY**—rich two and three tone colors that permanently retain their life and sparkle.
5. **FIRE AND STAIN RESISTANT**—unmarred by lighted cigarettes and matches; not stained by acids, alkalis, ink, etc. Ideal for laboratories.
6. **STYLE**—wide choice of colors and designs, adaptable to any interior plan.

TWO TYPES AVAILABLE

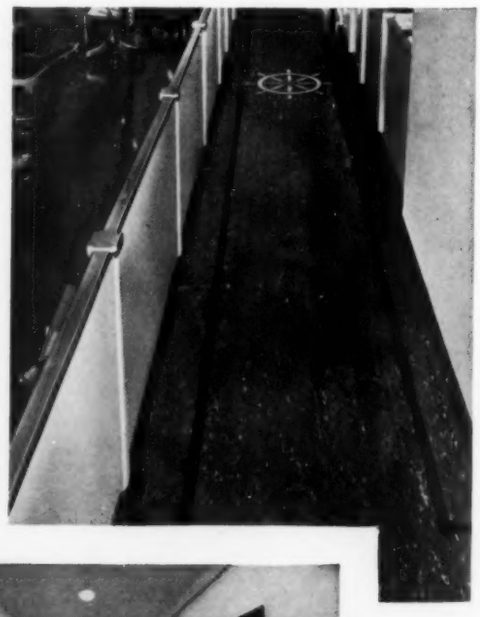
GOODYEAR RUBBER TILE—laid in individual blocks of specified thickness, size, shape and color—applied piece by piece in any desired pattern.

GOODYEAR WINGFOOT SHEET RUBBER FLOORING—made in continuous lengths like linoleum and laid in the same manner—the most economical, ***permanent*** covering for large school-room floors. Available in a wide range of colors with border and feature strips adaptable to more than 100,000 different designs.

For complete specifications, see Sweet's Architectural Catalogue

THE GREATEST NAME IN RUBBER

GOODYEAR



(Above) — Goodyear Wingfoot Flooring with border strip and mortised design

(Left) — Typical Goodyear Rubber Tile school floors

GRINNELL COMPANY INC.

EXECUTIVE OFFICES

Providence Rhode Island

BRANCH OFFICES IN PRINCIPAL CITIES OF UNITED STATES AND CANADA

Don't Let This Happen To You!

Figures compiled by the National Board of Fire Underwriters indicate that fires are occurring in School property at the average rate of five a day. That the annual loss on School and College property in the United States is estimated at over $5,000,000.00. As for the loss of life, no money value can ever measure the sorrow and suffering in any family where a member was seriously crippled or mercilessly burned to death.

Regardless of the fact that fire-resistive building materials, structural improvements, fire drills, etc., are being employed to combat it, fire is daily exacting this heavy toll. Although of modern construction, a building can be destroyed by its burning contents. The interior becomes a blazing inferno and the intense heat causes walls to topple, roofs to fall. Despite the valiant efforts of local fire fighters, often summoned too late, the building becomes a mass of ruins.

Grinnell DuraSpeed Sprinkler

Such catastrophes result in vigorous investigations. Public sentiment is aroused and severe criticism, just and unjust, is heaped upon those responsible for the lives and property entrusted to their care.

Don't let this happen to you. Make sure your School or College is safe by protecting it with Grinnell Automatic Sprinklers. For over 60 years, they have been safeguarding millions of lives and billions of property dollars from fire in all classes of buildings. On silent duty day and night, year after year, they are on guard to check a fire immediately. When a fire starts, the water starts and the fire goes out.

Many Schools and Colleges are enjoying the sure protection, lower fire insurance rates and other benefits which Grinnell Automatic Sprinklers assure. Why not join them today? We shall be pleased to survey your premises and submit an estimate for your consideration, all without cost or obligation. Your wishes expressed to this office or to our Branch Offices will receive prompt attention.

• • •

In addition to world famous Grinnell Automatic Sprinkler Systems, we welcome inquiries on Pipe, Fittings, Hangers, Valves, Traps, Unit Heaters, Welding Fittings, Prefabricated Piping and general Plumbing and Heating Supplies.

Grinnell Quartzoid Sprinkler

HOLOPHANE COMPANY, INC.

342 Madison Ave.
New York

WORKS—Newark, Ohio

CANADIAN OFFICE: Toronto

ADVANCED LIGHTING *for every school need . .*

Modern Auditorium Lighting

HOLOPHANE Planned Lighting produces the greatest amount of useful light from a given investment in electric current and lamps.

In schools and colleges throughout the country Holophane proves its educational value by conserving eyesight and promoting better work.

Special Lighting for Corridors

For every area in your school—indoor and outdoor—there is a Holophane unit specifically adapted to provide the most appropriate illumination at the lowest operating cost.

In-Bilt Classroom Lighting

A highly specialized engineering department is maintained for the purpose of giving free planning and specification service on lighting. Just state *your* problem, and leave the solution to Holophane.

HOLOPHANE
PLANNED LIGHTING
PRODUCES THE GREATEST AMOUNT OF USEFUL LIGHT

KERNER INCINERATOR COMPANY

3701 North Richards Street, Milwaukee, Wisconsin

OFFICES AND AGENCIES IN OVER 150 CITIES

PRODUCTS

KERNERATORS: For the prompt, safe, and sanitary disposal of all kinds of rubbish (including garbage) by incineration. Manufactured in four types.

Flue-fed	Retort (downdraft)
Basement-fed	Gas-fired ("Commercial")

The characteristics and advantages of each type are described below.

SCHOOL BUILDING PROBLEMS SOLVED BY KERNERATORS

SAFETY

The KERNERATOR, by providing a place designed for burning all waste eliminates the fire hazard and the smoke panic hazard inherent in the collection and storage of such waste. Even bailing paper sorted from other waste is a doubtful economy. This is especially so when weighed against the possible hazard.

SANITATION AND HYGIENE

The KERNERATOR provides a convenient, sanitary, and economical method for handling all sweepings, lunch remains, garbage from cafeteria (if there is one), and all promiscuous waste.

Flues may be so located that one set of hopper doors will open into the girls' washrooms. This idea has been adopted by a number of Architects (names upon request) with very satisfactory results in actual operation.

The KERNERATOR provides a means for the disposal of sanitary waste from girls' washrooms. In so doing the KERNERATOR eliminates both the disturbance to routine, and the damage and maintenance expense of clogged drains.

ECONOMY

The KERNERATOR eliminates the expense of labor, time, and equipment in handling, storing and transporting rubbish and garbage; the necessity of daily collections of waste paper and sweepings—frequent trucking. It also cuts the cost of plumbing repairs due to drains stopped by sanitary waste in girls' washrooms.

APPLICATION

Flue-fed

This type offers the utmost in convenience, labor saving, and safety through immediate disposal of waste. The incinerator chamber in the basement is vented through a flue directly out of the top of the incinerator roof.

In this same flue, doors of a hopper type are provided at convenient locations on the floors above. These provide for disposal of all waste at the nearest possible point to the origin of the waste. Once deposited through the hopper door, the waste is contained in the incinerator designed for burning it.

This type may also be fed from the basement direct into the incinerator chamber.

Basement-fed

In existing buildings where no flue is available either large enough to provide a fallway or located conveniently for hopper doors, a basement-fed KERNERATOR provides all of the advantages except the hopper door convenience described above. In buildings without a basement and of one floor, the basement direct feeding has all the convenience and safety.

Retort (downdraft)

This type is intended for special burning problems involving the use of fuel either in the form of dry waste or commercial fuel to burn waste which will not in itself maintain combustion.

Commercial

This type of unit is a semi-portable, self-contained unit. It is primarily a slow burning garbage destructor employing gas fuel or adapted for use of soft coal fuel. Each unit is capable of handling the drained but wet garbage from 600 to 800 cafeteria meals per day.

SERVICE

The KERNERATOR is made and sold by the pioneer in the flue-fed incineration field. Satisfactory operation is guaranteed by a financially sound organization having a stable, trained corps of incinerator experts with a wide experience in school installations.

FURTHER INFORMATION

When you are planning a school building, may we send a specialist to discuss your waste disposal problems? He will be glad to recommend the proper type and size of equipment depending upon the number of rooms, number of pupils, and the height of the building.

Central High School, Fort Worth, Texas
W. G. Clarkson Co., Architects

Roxbury Latin School, West Roxbury, Boston, Mass.
Perry, Shaw & Hepburn, Architects

THE KINNEAR MANUFACTURING CO.

2240–2260 Fields Avenue
Columbus, Ohio

Exclusively Manufacturers of Rolling Doors and Grilles

•

METAL ROLLING GRILLES

•

AUTOMATIC FIRE DOORS and SHUTTERS

•

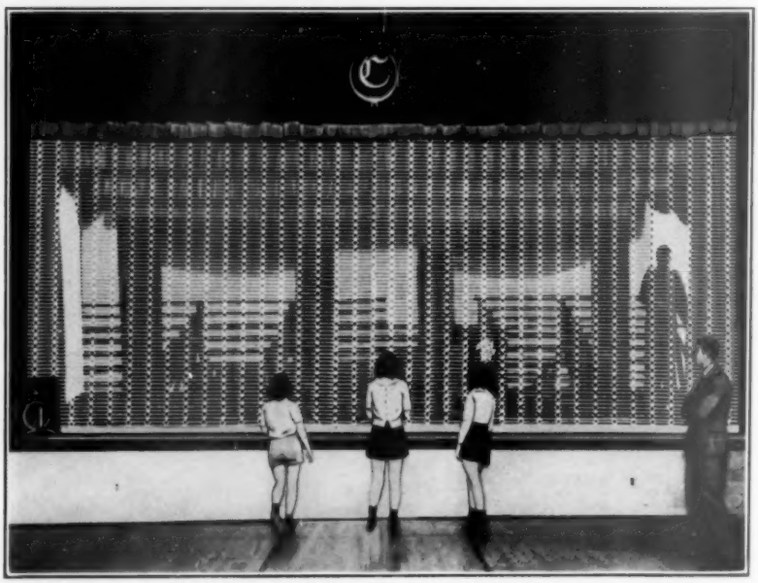
STEEL ROLLING SERVICE DOORS

•

WOOD ROLLING PARTITIONS

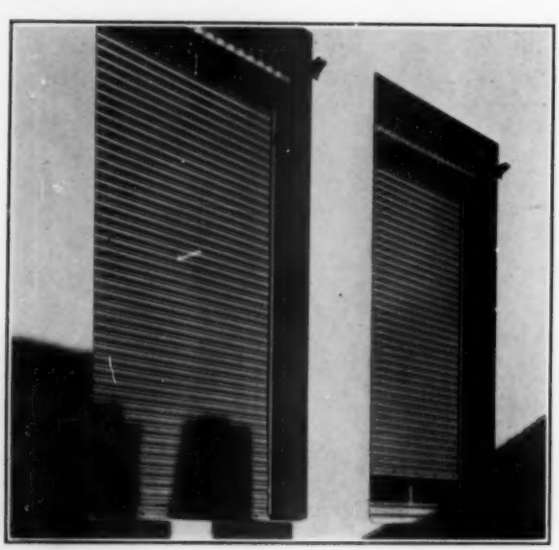
•

SECTIONAL UPWARD-ACTING DOORS



A Kinnear Rolling Grille over the stage in a combination gym and auditorium illustrates suitability of the Grille for closing off hallways, rooms or any other point where protection must be provided without sacrificing space, air, light, vision, or interior design

THE KINNEAR MANUFACTURING CO. pioneered and has devoted its entire effort for the past 41 years to rolling or **Upward-Acting** type Doors and Grilles. They have established the reputation throughout the world as specialists in doors that save floor and wall space, operate more conveniently, reduce maintenance expense through unusual durability and that can be built for old or new buildings for inside or outside use. Composed of a flexible metal curtain or grille which coils above the lintel, similar to a window shade, they can be installed either on the face of the wall or between the jambs when concealment of mechanism is desired. Springs provide perfect counterbalance. They can also be operated manually, mechanically or electrically.



THE AMERICAN SCHOOL AND UNIVERSITY

Kinnear Doors come in two distinct classifications, Service and Fire. For the latter case, though suitable for service purposes, they are "labeled" and equipped with mechanism for automatic closure in case of fire. Where projection against trespassing alone is desired the Kinnear Grille is ideal—strong . . . attractive . . . out of sight when open . . . easy to operate . . . and admits air, light and vision.

With a nation-wide organization and the finest door manufacturing facilities Kinnear can handle any of your opening requirements with equipment that costs less to operate and maintain. Ask for a Kinnear recommendation.

BRANCH OFFICES

Boston	New Orleans	Detroit
New York	Pittsburgh	Chicago
Philadelphia	Cleveland	San Francisco
Washington	Cincinnati	Baltimore

AGENTS IN ALL PRINCIPAL CITIES

KINNEAR ROLLING DOORS

THE LANDIS PROGRAM CLOCK CO.

Waynesboro, Pa.

GRAYBAR ELECTRIC CO., DISTRIBUTORS

LANDIS PRODUCTS FOR SCHOOL AND COLLEGE USE

The Landis System includes a complete line of high-grade Master Clocks, Secondary Clocks, Program Machines, Control Panels, Program Bell Push Button Boards and Special Time Control Apparatus. Its completeness and flexibility enables the school architect to select equipment to meet the most exacting requirements for either large or small school.

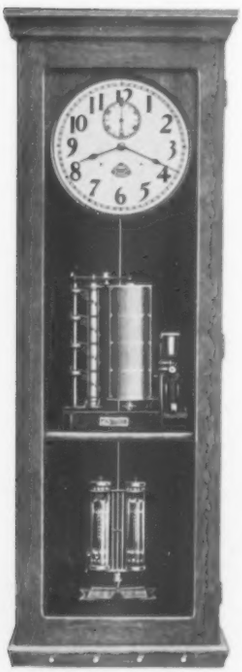
All Program Bells, Buzzers, Horns, etc., also Fire Alarm and Telephone Systems furnished with Landis equipment are of the highest quality.

Landis also manufactures a complete line of Laboratory Voltage Distribution Control Panels, Instructors' Panels, Student Table Outlets, etc., for use in science laboratories.

TYPE OF SYSTEM

The Landis System is the minute impulse automatic hourly synchronized type of electric time system whereby any number of secondary clocks and automatic program machines for indicating and signaling time can be operated by minute impulses from the master clock. The automatic hourly synchronized control is arranged to automatically check the program machine and each secondary clock hourly and, if necessary, reset same to the correct time of the master clock if ever disturbed due to current interruptions or other outside irregularities.

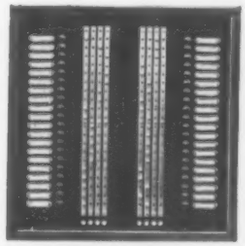
This type of system is by far the most rugged, simple and economical, and is greatly preferred where there is a necessity for group controlling of clocks. It results in uniform time and signals, making possible coordinated action and efficiency.



Combined Master and Program Clock 1-Minute Type Program Machine

Write for illustrated booklet, "Landis Electric Time and Program Clock Systems," or consult the nearest Graybar distributor

Style 2M Round Metal Secondary Clock



Push Button and Cross Connecting Board

Style 3S Square Wood Secondary Clock

Secondary clocks made in a wide range of styles and sizes, also double dial clocks, and ornamental marble and skeleton dial clocks.

OFFICES IN 74 PRINCIPAL CITIES

LEVERING BROTHERS, INC.

200 Key Highway
Baltimore, Md.

CAST BRONZE SCHOOL TABLETS, MEMORIALS AND HONOR ROLLS

Practically every school has occasion, at some time, to commemorate an important event in its history, or to do honor to a notable teacher, principal, superintendent, pupil, school founder, or benefactor; and the question arises as to what type of memorial will be most fitting, beautiful and lasting. The Bronze Tablet, Honor Roll, or Medal, comes to mind immediately as a completely satisfactory answer to this need.

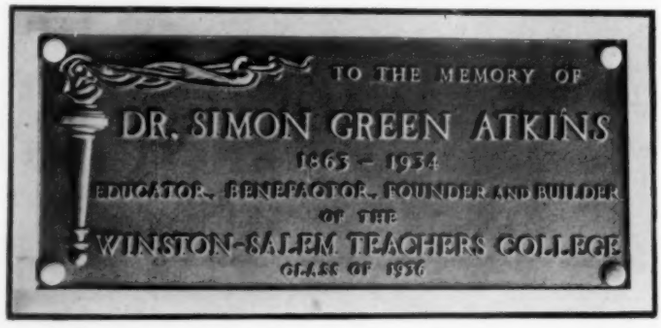
Levering Brothers, Inc., of Baltimore, Md., will be glad to have schools consult with them in connection with their choice of a suitable memorial of bronze, and will submit special or standard designs to fit any requirement.

Contrary to general belief, the cost of bronze is not extravagant when measured with the life of the object. A Bronze Tablet lasts forever, and actually improves with age, growing more beautiful as time goes on. Bronze work by Levering Brothers, Inc., from the simplest to the most intricate piece, is of unsurpassed beauty of design and craftsmanship.

ALUMINUM—ANOTHER BEAUTIFUL AND LASTING MATERIAL FOR SCHOOL MEMORIALS AND TABLETS

Although Aluminum Castings have not long been in use in the design and composition of memorials, tablets and wall plaques, both the beauty of Aluminum and its long life make it a perfect metal for the purpose—and no more expensive than Bronze, when you consider its lighter weight.

Your inquiries on either Bronze or Aluminum are solicited. Sketches, suggestions and prices will be sent on request.



Above—
Memorial Tablet
11″ x 26″

At Left—
Commemorative Tablet
30″ x 42″

At Right—
School Tablet
18″ x 24″

JOHN E. LINGO & SON, INC.

Established 1897

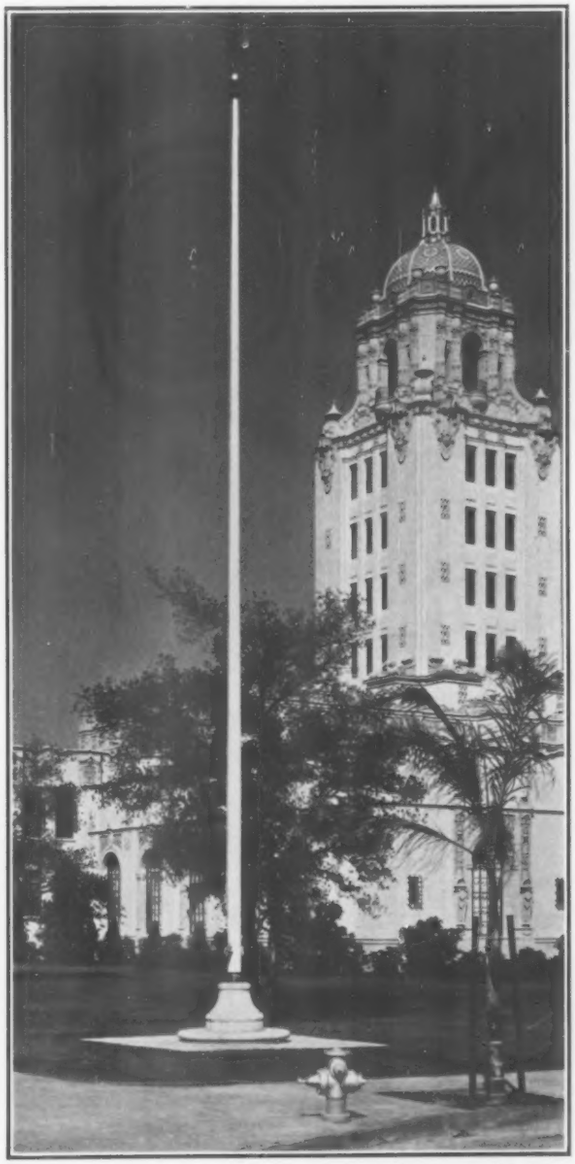
Manufacturers of
Metal Flagpoles
29th Street & Buren Avenue
Camden, New Jersey

Telephone: Camden 487

TWO DISTINCT TYPES OF STEEL FLAGPOLES

CONTINUOUS STRAIGHT TAPERED FLAGPOLES

Continuous Straight Tapered flagpoles are made of high grade open hearth steel, have a smooth uninterrupted exterior surface throughout without visible joints and offsets, and resemble a finished wooden flagpole in appearance. They are standardized for ground and roof settings in lengths from 20 ft. to 100 ft. These poles are carried in stock and prompt shipments can be made. They are usually shipped in one piece without field joints. To avoid high freight costs, long poles of this type are shipped in two pieces with a machined fit field joint. The erector merely pushes the two sections together at the erection site, welds a small circumferencial bead at the joint and then files or grinds the bead smooth, giving the pole an unbroken exterior surface throughout.



50 Feet Above Grade, Continuous Straight Tapered Heavy Type Steel Flagpole, City Hall, Beverly Hills, Calif.

Continuous Straight Tapered steel flagpoles are ideal as replacements of wooden flagpoles, for not only is the appearance the same but the steel pole affords lightning protection, unlimited life and dependability not usually found in a wooden flagpole.

SWAGED SECTIONAL FLAGPOLES

Swaged Sectional flagpoles are fabricated in sections of copper bearing steel pipe with swaged, telescoped and shrunk joints without the use of bolts, rivets, pins, screw couplings or lead calking. They are standardized for ground and roof settings in lengths from 15 ft. to 125 ft. These poles are carried in stock and shipped in knocked down sections with field joints. The erector merely pushes or telescopes the knock-down sections together at the erection site and after the pole is erected the field joints are made airtight and watertight by calking steel to steel with an ordinary hammer and calking chisel.

OTHER PRODUCTS

We also manufacture Continuous Entasis Tapered Copper Bearing Steel, Stainless Steel, Bronze, Nickel Silver and Aluminum flagpoles, standardized for ground or roof settings in various heights and diameters. These poles are especially suitable for monuments, memorials and other buildings of exceptional architectural design. Poles of this type are also standardized for window or outrigger settings.

CATALOGS AND SERVICE

Catalog and Pamphlets giving full information, details, specifications, prices, etc., gladly mailed on application.

Our Engineering Department will gladly assist you in planning your contemplated flagpole installations most satisfactorily and economically, and without obligation on your part whatsoever.

WARNING!

In the interest of safety and for the protection of life and property, we implore Officials to rigidly inspect immediately all their flagpoles now in use.

A wooden flagpole which appears perfect on the outside can be so deteriorated on the inside that only a shell remains and is likely to fall in the next heavy wind. A perfect wooden flagpole offers no resistance to lightning and can readily be destroyed in the next thunder storm.

A steel flagpole improperly designed can fall in a heavy wind or snap off if joined together with screw couplings, flanges, etc.

Protect your property, the general public and particularly children, by removing these hazards now!

Insure against falling poles by installing "LINGO" steel flagpoles. They are properly designed, constructed to safely withstand winds of hurricane force and are natural lightning protectors.

Inspection of Your Flagpoles Now May Save Lives Later!

MACBETH-EVANS DIVISION
Corning Glass Works

Charleroi Pennsylvania

In the development of diffusing glass for illuminating purposes, the Macbeth-Evans Glass Co. leads the world. . . . We present above our Romanesque enclosing globe of Galax Glass. This semi-indirect type combines the most desirable eye-protecting features with high lighting efficiency. Macbeth's Galax globes are made from homogeneous glass and provide dual opacity. The bottom of the globe is of dense white, highly reflecting opacity assuring low intrinsic brightness with a high percentage of light directed upward. The upper portion of the globe is of light diffusing glass, sufficient in density to eliminate lamp filament striations and shadows on walls and ceilings. For classroom illumination, the Macbeth Romanesque stands apart as a globe of unusual efficiency. Its use guarantees the very best in modern lighting. It has already been installed in a great number of the better schools throughout this country. . . . Below we illustrate an important characteristic of Macbeth Globes —the chip-proof edge. This feature not only strengthens the glass materially but it makes the globes easier and safer to handle in cleaning. . . . For detailed information on Macbeth Globes and photometric data, write us direct. You will incur no obligation.

MACBETH *Illuminating* GLOBES

THE AMERICAN SCHOOL AND UNIVERSITY

MAPLE FLOORING MANUFACTURERS ASSOCIATION

332 South Michigan Avenue, Chicago, Ill.

Floor *with* Maple

In Class Rooms, Assembly Halls, Shops and Gymnasiums

PRODUCTS

MFMA trademarked Northern Hard Maple, Beech and Birch Floorings, standardized and guaranteed as to grade and manufacture.

QUALITIES

Northern Hard Maple—a tight grained, hard fibered wood—has the school-room floor essential qualities of long wear, smoothness, cleanliness and foot comfort. Economical in installation and maintenance cost. Provides firm anchorage for desks, facilitates alterations.

GOOD SERVICE FINISHES

Service finishes that seal the surface of Hard Maple, keep out dirt, resist soil stains, prove non-slippery—now available. Will not mar, scratch or flake off. Easy to clean and economical to maintain.

GRADING RULES

MFMA Northern Hard Maple, Beech and Birch Floorings are kiln-dried, sold in standard grades, described in detail in a book of Grading Rules, available on application.

Standard lengths, 25/32 inch and thicker strip flooring as follows:

MFMA First Grade: 2 to 16 feet, may contain up to 25% of 2 to 3½ feet, inclusive.

MFMA Second Grade: 1½ to 16 feet, may contain up to 40% of 1½ to 3½ feet, inclusive.

MFMA Third Grade: 1 to 16 feet, may contain up to 60% of 1 to 3½ feet, inclusive.

STANDARD MEASUREMENT

Flooring ½ inch and thicker, all faces, is measured ¾-inch waste for matching.

Flooring ⅜ inch (11/32-inch) thick, all faces, is measured ½-inch waste for matching.

Jointed flooring, all thicknesses and faces, is measured ½-inch waste.

STANDARDIZATION

MFMA flooring is made to accurate specifications standardized by the Association. The Association maintains supervision over the products of its members through regular grade inspection at mills and its re-inspection service. Competent inspectors are employed for this purpose.

PATTERNS

You can lay Maple in strips or blocks—with or without pattern—over screeds, wood or concrete subfloors.

THICKNESSES AND FACES

Popular sizes of Hard Maple strip flooring are 25/32″, 33/32″ and 41/32″ thicknesses in the 1½″ (25/32″ only), 2″, 2¼″ and 3¼″ face widths.

Hard Maple block flooring, cut to exact, uniform lengths, in 25/32″ and 33/32″ thicknesses, is available in individual blocks and in fabricated squares or rectangles.

LITERATURE FOR FREE DISTRIBUTION

The following booklets and folders are offered through the office of the Association, and will gladly be mailed on request, free of charge:

"**MFMA** Grading Rules and Standard Specifications, including other data of value to Architects—issued in filing pocket folder of A.I.A. file size" (May, 1935, edition).

"Heavy Duty Finishes for Maple Flooring—**MFMA** Approved."

"Grading Rules for **MFMA** Floorings—pocket size."

"Hard Maple Flooring"—a folder containing reproductions of the product.

Hard Maple Floor in Foster School, Evanston, Illinois, 35 years old, reconditioned with Heavy-Duty finish — floor previously scrubbed — no treatment

Laying Hard Maple Block Flooring in the University of Minnesota Indoor Sports Building

Let our Service and Research Department assist you with your flooring problems. Write us

THOS. MOULDING FLOOR MFG. CO.

EXECUTIVE OFFICES
165 West Wacker Drive, Chicago, Ill.

New York, N. Y., Grand Central Terminal Building
Philadelphia, Pa., Architects Building
Minneapolis, Minn., Thorpe Building
Des Moines, Iowa, Hubbell Building
DISTRICT SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

THE COMPANY

Thos. Moulding has been in the business of manufacturing and installing floors for approximately eighteen years.

The factory, located on the Belt Railroad, Chicago, Ill., is a modern plant with a capacity of 20,000,000 sq. ft. of flooring per year. It maintains a laboratory, completely equipped for research, and thoroughly tests both raw and finished goods to assure uniformity. THOS. MOULDING FLOOR CO. and other approved flooring contractors contract to install **Moultile** anywhere in the United States and nearby countries. Skilled mechanics are employed.

MOULTILE — REINFORCED MASTER ASPHALT TILE

Moultile Asphalt Tile is a highly attractive, durable, resilient floor material, suitable for use as a finished floor over smooth subfloors of all kinds—whether newly laid or existing, of wood or concrete. It is supplied in the form of individual tiles which can be laid in an unlimited variety of patterns and color combinations. Original cost, installation and maintenance are surprisingly low.

Moultile solves the problem of a flooring for use over cement resting on the ground. It is affected by neither the alkali nor the dampness always present where cement is in contact with the ground.

Plant Science Building, Cornell University, Ithaca, N. Y. 80,000 ft. Moultile.

Made to Federal Specifications

Moultile is made to Federal Specification No. SS-T-306 which specifies exacting standards of strength, flexibility, size, indentation and thickness.

Moultile is Reinforced

By use of special reinforcing materials and processes all Moultile is now reinforced to give an approximate 50% greater strength than it was heretofore thought possible to create.

Moultile Reinforced was originally developed for resisting vibration and bridging open joints when installed over wood. So satisfactory have results been in this connection that Moultile Reinforced is now standard production for all orders.

Salient Characteristics

Moultile is durable—will endure a lifetime. The impact and abrasion of traffic will not roughen its surface nor dull its bright colors. It remains permanently bonded to the subfloor, and having no appreciable coefficient of expansion or contraction, will not curl or buckle at the joints.

Moultile is quiet underfoot, and has a pleasant resilience and elasticity. When dry, unless waxed, Moultile is positively non-slip. When wet, it is less slippery than other smooth-surface floor materials. Moultile is a positive electrical non-conductor, and will not support combustion or ignite from the surface.

Moultile is non-absorbent, and will not rot or develop any odor. Proper care with maintenance materials which we supply is easy and inexpensive.

Special Types of Moultile

Moultile is made in a number of special types, to suit varying conditions of service. **Moultile "Greaseproof"** may be used in school kitchens, cafeterias, domestic science rooms, etc. **Moultile "Acid-resistant"** is ideal for school laboratories, where chemicals might damage other types of flooring. **Moultile "Flexed"** gives maximum resilience and quiet in lobbies, halls and stairways. **Moultile "Tempered"** offers greater resistance to indentation from desks, chairs and other fixtures. Ideal for class-rooms. **Moultile "Heavy Duty"** withstands the abuse of trucking—may be used in laundries, shops, etc.

All types, thicknesses and colors are obtainable with a waterproof wax coating burnished right into the tile at the factory. Combinations of the special types listed above, such as "Grease-proof Tempered," "Acid-resistant Flexed," etc., are also available.

Colors

Colors are permanently clear in tone, of attractive shades, and not subject to fading or deterioration. Approximately 60 plain and marbleized shades in browns, black, blues, white, grays, tans, greens, reds, etc. Special colors on request.

Sizes

Moultile is furnished in ⅛, 3/16 and ¼ in. thicknesses, and in the following sizes: 3x3, 3x6, 4½x4½, 6x6, 6x12, 9x9, 9x18, 12x12, 12x24, 18x24 in., and long hexagon.

Moultile Cove Base

Moultile Cove Base is now available to match all colors of Moultile Master Asphalt Tile. It is made 6 in. high, ¼ in. thick at wall face with lip for either ⅛ or 3/16 in. tile and with ½ in. radius at cove. Inside and outside corner pieces can also be furnished. As a backing, the smooth plaster finish should be carried to floor level.

THOS. MOULDING ASPHALCRETE

Asphalcrete is a cushioned filler for smoothing up bumpy, uneven or poorly troweled cement floors to make a suitable foundation for floor coverings such as asphalt tile, rubber tile, linoleum, etc. It is a successful and economical substitute for cement topping in new construction. Asphalcrete is much cheaper, is resilient and contributes sound deadening qualities not found in cement topping.

Note: Cement subfloors steel troweled to a hard, smooth finish provide a suitable foundation for Moultile without further treatment.

THOS. MOULDING UNDERLAYMENT

Underlayment is a light weight plastic cement which may be laid over wood floors in any condition, to provide a perfect foundation for all types of floor covering—asphalt tile, linoleum, mastic, cork tile, rubber tile, linoleum tile. Underlayment is non-inflammable—materially reduces fire hazard and earns lower insurance rates. It also contributes towards soundproofing wherever used.

Thos. Moulding Underlayment corrects defects in old wood floors as follows:

(1) Levels up the uneven wood subfloors.
(2) Flows into the open joints—eliminates possibility of joint lines showing through on finished floor covering.
(3) Underlayment is of such strength that it diminishes the spring of springy boards.
(4) Forms a smooth seamless surface equivalent to a smooth cement floor on which to lay the floor covering.
(5) Will not crumble, buckle, or crack to cause similar defects in finished floor.

THOS. MOULDING UNDERCUSHION

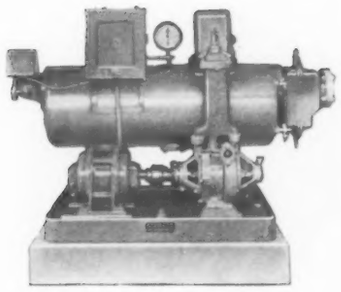
Although Thos. Moulding Underlayment is an ideal type of foundation for all floor coverings over wood floors, there are certain instances where Thos. Moulding Undercushion offers a satisfactory solution at lower cost. Thos Moulding Undercushion is a waterproof asphalt saturated felt paper made to our particular specifications for thickness, strength, and smoothness.

Thornton Township High School, Calumet City, Ill. 60,000 ft. Moultile. "Tempered" in Classrooms, "Flexed" in Corridors. Wm. S. Hutton, Architect

THE NASH ENGINEERING COMPANY

South Norwalk, Conn., U. S. A.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES

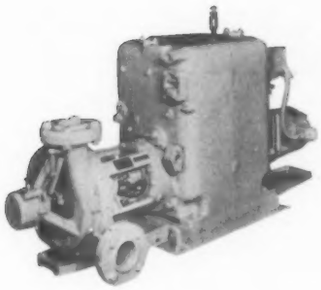


JENNINGS RETURN LINE VACUUM HEATING PUMPS

Standard with the heating industry for over sixteen years. They remove air and condensation from the return lines of vacuum steam heating systems, discharging the air to atmosphere and returning the water to the boiler.

Two independent units are combined in a single casing—an air unit and a water unit. Impellers of both are mounted on the same shaft. The pump is bronze fitted throughout.

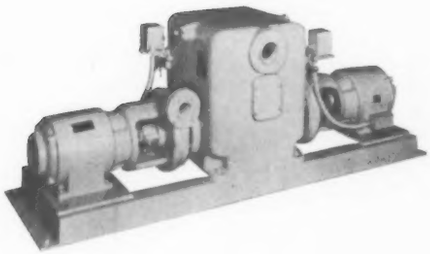
Supplied either direct connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous or automatic operation against pressures up to 40 lbs. Supplied standard in capacities up to 300,000 sq. ft. E.D.R.



JENNINGS VAPOR TURBINE VACUUM HEATING PUMPS

The Jennings Vapor Turbine Heating Pump combines all of the advantages of the standard return line heating pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains on any system, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the safety and economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current. Furnished standard in capacities up to 65,000 sq. ft. E.D.R. Over 65,000 sq. ft. and up to 150,000 sq. ft. Information on request.



CONDENSATION PUMP AND RECEIVER

Removes condensation from radiators in return line steam heating systems and pumps condensation back to the boiler.

They are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Bronze fitted throughout, with Tobin bronze shaft. Impeller is of special design adapted to handling hot water with highest efficiency.

Jennings Condensation Pumps are furnished in standard sizes with capacities ranging from 1½ to 225 g.p.m. of water, for serving from 1,000 to 150,000 sq. ft. equivalent direct radiation.

JENNINGS SUMP AND SEWAGE PUMPS AND SEWAGE EJECTORS

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing.

Capacities and heads to meet all requirements.

JOHN J. NESBITT, INC.

Manufacturers of

Heating, Ventilating and Air Conditioning Equipment

Holmesburg, Philadelphia, Pa.

11 Park Place, New York City

THE NESBITT SYNCRETIZER

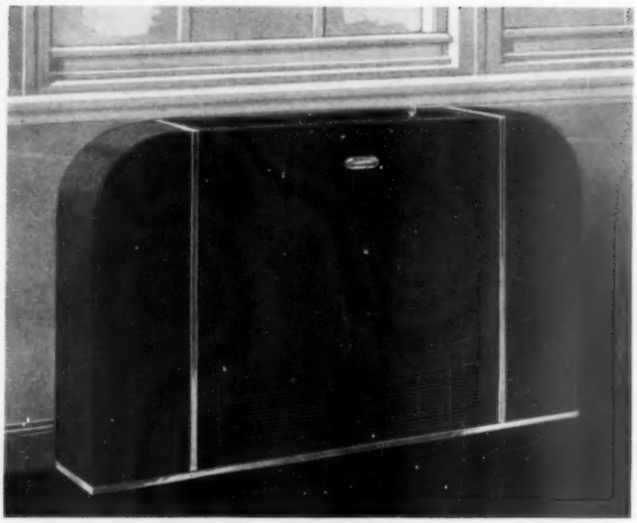
has completely revolutionized standards of schoolroom heating and ventilating. Fully automatic, and doubly controlled by a room thermostat and an air-stream thermostat, this advanced heating and ventilating unit harmonizes, or **syncretizes** room and air-stream temperatures, thus producing **Syncretized Air** . . . constant spring weather indoors.

Fresh Air Without Drafts or Overheating

Nesbitt Syncretizers are adjustable, according to any state's requirements, to deliver all or part outdoor air, but **always some outdoor air,** to occupied classrooms. Nesbitt's insistence that outdoor air ventilation is regularly needed to maintain comfort and health and to abate odors has the weighty backing of nearly all state laws, of the American Society of Heating and Ventilating Engineers, and of the latest researches. The Air-Stream Minimum Temperature Control provides that all air taken from outdoors is first warmed to a safe minimum temperature, thus preventing drafts. The Room Temperature Control assures that the desired room temperature will be uniformly maintained, without permitting overheating.

New Type Radiator

In the development of the Syncretizer an entirely new type of heating radiator was evolved . . . one that possesses a high heating capacity, yet is susceptible to the slightest demands of its two controls,—either the room thermostat or the air-stream thermostat. Its success lies in the use of dual steam-distributing tubes within the regular radiator tubes—a Nesbitt innovation. Whether the radiator is supplying its full heat capacity, or merely tempering the incoming air, there is assured the **equally** warmed air discharge which contributes largely to Syncretizer success and economy.



The Ideal Heating and Ventilating Unit for TODAY and TOMORROW—The Nesbitt Syncretizer

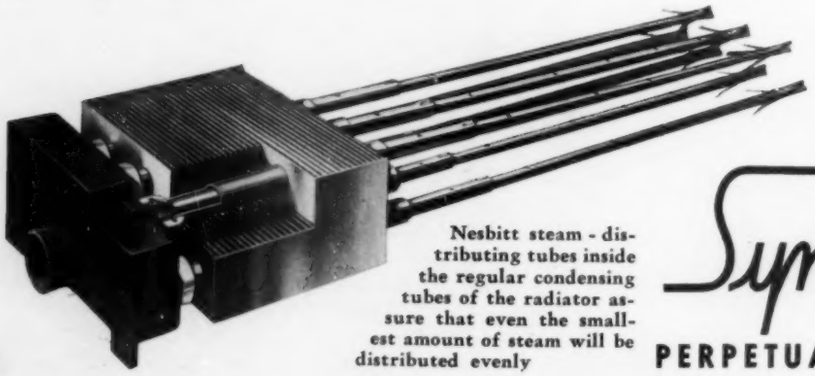
Beautiful–Quiet–Economical

The Nesbitt Syncretizer is uniquely modern in appearance, yet its beauty is entirely conformable to schoolroom design. Tests have proved it to be the quietest of units. But the point which wins it great favor with school boards is its surpassing economy of fuel.

Widespread Acceptance

Today, in over 50,000 schoolrooms of the United States and Canada, more than two million girls and boys enjoy the health and comfort of vital air, properly filtered, tempered and distributed according to the best scientific knowledge, by heating and ventilating units manufactured by John J. Nesbitt, Inc., or its constituent, the Buckeye Blower Company.

Nesbitt Syncretizers are sold by American Blower Corporation, Buckeye Blower Company, and John J. Nesbitt, Inc. Complete information is contained in Publication No. 226, "The Story of Syncretized Air." Complete engineering data is contained in Publication No. 225. Both publications are free on request. Address John J. Nesbitt, Inc., Holmesburg, Philadelphia, Pa., or 11 Park Place, New York City.



Nesbitt steam-distributing tubes inside the regular condensing tubes of the radiator assure that even the smallest amount of steam will be distributed evenly

NESBITT Syncretized Air

PERPETUAL JUNE IN THE CLASSROOM

Norton Door Closers

are manufactured by the

NORTON DOOR CLOSER COMPANY

Division of the Yale & Towne Mfg. Co.

2900 North Western Avenue
Chicago, Illinois

Lewis C. Norton invented the first door control device in 1880. Since that time portals of education have had the advantages of some type of quiet operation. However, today, the modern Norton Door Closing devices are highly developed as to efficiency, and are varied to meet many special problems. Schools of all sizes throughout the world are using the Norton Door Closers and Norton Door Closing devices to insure quiet, smooth and leakproof door control . . . to protect in time of fire hazards . . . to make the door hold in certain positions when open . . . to be held open or closed under different draft conditions.

The Norton Door Closers are built on the rack and pinion principle, which controls the entire swing of the door and greatly reduces the strain on the closer, the door and the hinges.

One outstanding feature of the Norton Door Closer is the specially engineered packing nut that is absolutely leakproof—this permits the use of mineral oil, which is the correct form of lubrication.

All Norton Door Closer parts are of high quality material. The exactness of manufacturing standards results in an accurate, smooth-working closer.

Consult, without obligation, Norton Door Closer Company which is prepared to recommend a solution for any door control problem. Write for Norton Catalog.

REPUBLIC STEEL CORPORATION

General Offices: Cleveland, Ohio

SALES OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES

REG U S PAT OFF
TONCAN
COPPER
MO-LYB-DEN-UM
IRON

School and university buildings represent long-time investments totaling many thousands of dollars. Maintenance costs run into substantial sums of money. For these reasons, it is sound business to use materials in construction and for replacement that will protect investment and reduce maintenance costs.

Such a material is Toncan Iron—the alloy of refined open-hearth iron, copper and molybdenum with the greatest resistance to rust and corrosion of any ferrous material in its price class. Records of more than 28 years of trouble-free, low-cost service prove its economy.

Toncan Iron is highly resistant to rust throughout its entire structure. It is ductile and easy to work—with the savings in fabrication and installation often offsetting its additional cost. Any extra cost that remains is more than eliminated by the longer life it affords.

TONCAN IRON SHEETS — This long-lasting metal is available in black and galvanized sheets in all standard sizes and gauges. It is ideal and is being widely used for all types of interior and exterior sheet metal work—roofing, flashing, gutters, eavestroughs, downspouts, heating and ventilating ducts, hoods and ducts in laboratories, etc. It is also available fabricated into laboratory furniture.

Toncan Iron Pipe was used for all underground plumbing lines in the Champaign Junior High School, Champaign, Illinois. Republic Steel Pipe was used for lines above ground

In Circle: **Rust-resisting Toncan Iron skylights on one of the buildings of the University of Minnesota**
Below: **Old Dartmouth Hall, Dartmouth College, with sheet metal parts of Toncan Iron**

TONCAN IRON PIPE — Many schools take no chances with their piping system—they have installed Toncan Iron Pipe. It is available black or galvanized and in standard or extra heavy weight. It is recommended for air, gas, hot and cold water, steam mains and returns, and drainage and vent lines. For ordinary piping service, Republic also makes high quality steel and copper-bearing steel pipe. Write for a copy of "Pipe for Permanence." It presents many interesting facts about pipe life and cost.

In the Silver Springs, Md., High School all steam return lines are rust-resisting Toncan Iron Pipe. Main and riser lines are Republic Copper-Bearing Steel Pipe

The RUBEROID Co.

ROOFING AND BUILDING PRODUCTS

Executive Offices: 500 FIFTH AVENUE, NEW YORK, N.Y.

BALTIMORE CHICAGO ERIE MILLIS MOBILE NEW YORK

RU-BER-OID Built-up Roofs

Regardless of the type of building you wish to erect or modernize, there is a suitable RU-BER-OID Roof appropriate to the architecture, to provide economical and weatherproof protection.

Where the roof is flat, or has little slope, Ruberoid Built-up Roofs are recommended. Here you have the choice of Asphalt, Coal Tar and Pitch, or Asbestos Roofs made up of multiple layers, to give the thickness, protection and safety that climate or special conditions demand. When desired, Ruberoid Built-up Roofs can be bonded for 10, 15 or 20 years, depending upon the specifications. Bonded Roofs are applied only by Ruberoid approved roofing contractors.

Asbestos-Cement Shingles

If the building has a pitched roof, you have the choice of rot-proof Eternit Asbestos Cement Shingles, in attractive colors, reproducing the charm of cypress, or with the texture of rough hewn rock. They are absolutely fireproof, and are approved by the Underwriters' Laboratories, Inc.

Asbestos Pipe Coverings

For the control of temperatures and to obtain reduction in fuel consumption in all types of buildings, The RUBEROID Co. has a complete line of Heat and Cold Insulating products, including Asbestos and 85% Magnesia Pipe Coverings, Asbestos Papers, Rock Wool, etc.

Benjamin Franklin High School, Rochester, New York. Protected with 1400 squares Ruberoid Built-up Roof. *Architect:* Gorden and Kaelber, Rochester, New York. *Roofers:* Florack, Schnoor & Englert, Rochester, New York.

Newmarble and Newtile

In addition, The RUBEROID Co. offers Newmarble and Newtile—asbestos-cement wall panels which simulate perfectly fine marble and ceramic tile. Newtile Wall Panels, with their easily cleaned, lustrous finish, are ideal for kitchens, lavatories, cafeterias, etc. Newmarble Wall Panels are excellent for use in lobbies, hallways, etc.

THE SAFE TREAD COMPANY

Manufacturers of

The Improved Abrasive Metal
—"SAFE TREAD"—

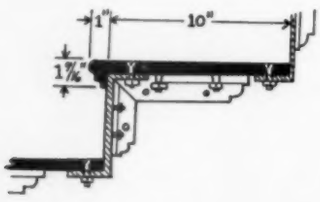
(Listed by the Underwriters Laboratories)

IRON—BRONZE—ALUMINUM

220 Broadway, New York City

AGENTS IN ALL PRINCIPAL CITIES

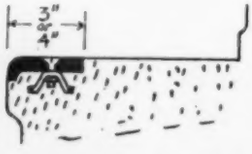
The necessity of providing slip-proof walkways for the safety of children and teachers has been established by the courts.



STYLE N5—FOR NEW CONSTRUCTION

Maintenance costs are likewise of utmost importance.

The use of "Safe Tread" Stairtreads—Door Sills, Platforms, Landings, etc., for new construction or repairs to existing walkways will insure the highest degree of **Nonslip** qualities and the greatest amount of **wearability.**

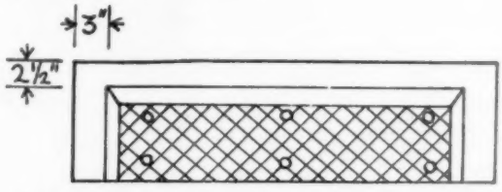


STYLE XL NOSINGS—FOR NEW CONCRETE

When Ordering or Requesting Quotation

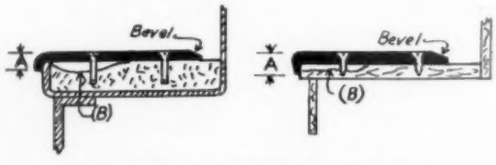
Specify iron, bronze or aluminum Safetread—style nosing desired, width overall or back of nosing, length, surface design (see below), quantity of each size. If unusual shapes are required furnish detail sketch or template. If for repairs advise what type material is being covered.

Submit your walkway problems to us, we shall be glad to help you solve them.



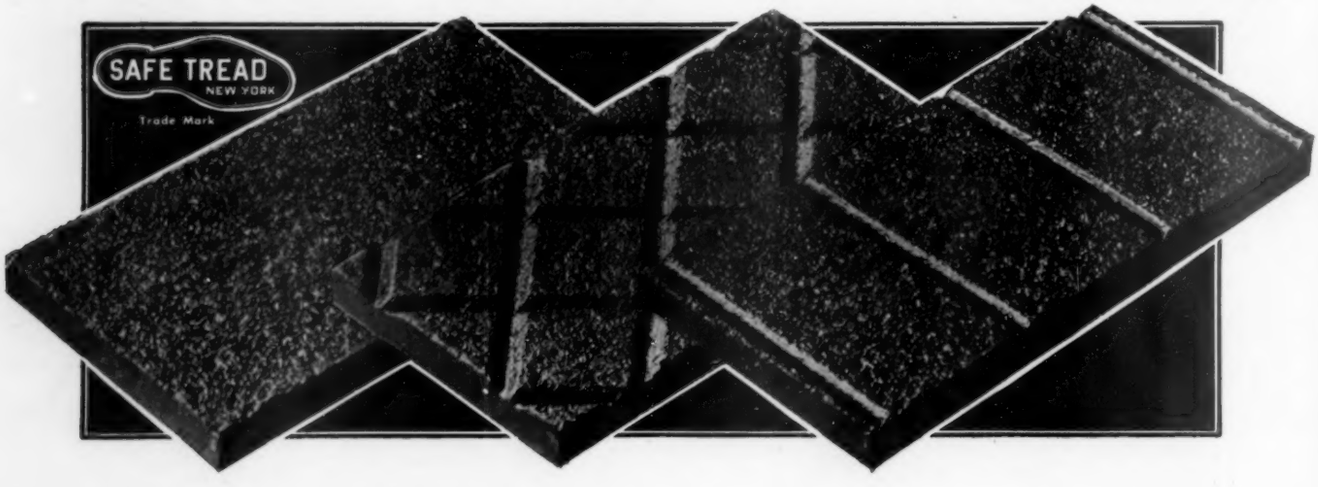
STYLE L—LIP ALONG FRONT EDGE, BEVELED BACKS AND ENDS

Recommended practice for repairs carry new tread to within 2½" of back edge of existing step and to within 3" of side of existing step.



STYLE L—FOR REPAIRS

	Concrete or Pan Filled	Wood, Marble or Stone
(A)	¼", ½", ¾", 1" or 1½", whichever required to cover worn area.	
(B)	Fill worn spots with cement before putting new treads in place. Secure with lead sleeves and wood screws.	



SCHWARZE ELECTRIC CO.

Special and General Service Sound Signals and Accessories

Adrian, Michigan

ESTABLISHED 1904 OFFICES IN PRINCIPAL CITIES

We specialize in automatic paging systems, sound signals and accessories for schools, dormitories, libraries, institutions, etc.

PRODUCTS

Bells, Buzzers, Horns, Kodaires, Sirens, Kodekall.

CHARACTERISTICS

Instantaneously responsive, clear sounding, distinct. Built to highest electrical and mechanical standards for economical and utmost dependability.

USES

Program clock, code paging, fire alarm and general purpose signaling systems.

FINISH

Bodies—Regular, black; Fire Duty, red.

Gongs—Special steel (nickel plated; Parkerized (black or udylite) and Cast Bell Metal (lacquered).

Catalog covering our complete line of Electrical Signal Devices on request.

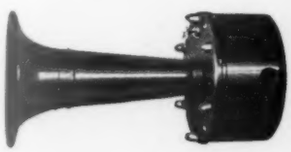
Bells

Vibrating or single stroke for A.C. or D.C. operation. Weatherproof or non-weatherproof; surface, conduit or outlet box mounting.

A.C. for 25 or 60 cycles, 6 volts and higher; parallel or series circuits. Gong sizes 3″ to 12″.

D.C. for 4 volts and higher. Parallel circuit only. Gong sizes 3″ to 12″.

Types: Neck pattern, monitor or double gong.



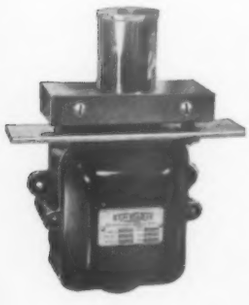
Horns

Vibrator Horns for A.C. or D.C. operation. Weatherproof or non-weatherproof; surface conduit or outlet box mounting.

A.C. for 25 or 60 cycle up to 220 volts.

D.C. up to 220 volts.

Styles: Drum, Short, Megaphone or Two-Way.



CHIMES

The Chime signal is ideal where a refined but effective signal is desired.

A.C. for 50 cycles and higher; 6 volts and higher; series or parallel operation.

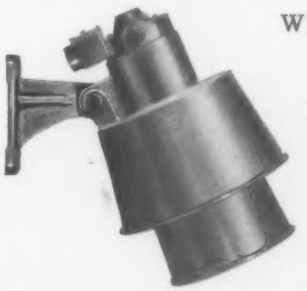
D.C. for 6 volts and higher; parallel operation only.

BUZZERS

Buzzers for A.C. or D.C. operation, light and heavy duty.

A.C. for 50 cycles and higher; 6 volts and higher; series or parallel operation.

D.C. for 4 volts and higher; parallel operation only.



WEATHERPROOF SIREN

For fire or any emergency signaling purpose. High speed, ball bearing motor. Instantaneously responsive, powerful, penetrating. For A.C. or D.C. operation. Standard color: red enamel.

MANFINDING KODEKALL

A simple inexpensive, dependable automatic paging system for schools, dormitories, libraries, institutions, etc. Sounds 30 different code signals. Repeats signals three times. Easy to install, operates on A.C. or D.C.

MISCELLANEOUS

Light and heavy duty bells, buzzers and chimes; non-electric, hand-trip bells; protective housings; gong guards, hanger plates; wood mats; break glass stations for fire alarm; concealed bell-buzzer combinations; transformers; relays; etc.

SEDGWICK MACHINE WORKS

Manufacturers of Dumb Waiters and Elevators

Telephone
WAtkins 9-4033

155 West 15th Street
New York, N. Y.

FACTORY
Poughkeepsie, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

General

Sedgwick Dumb Waiters and Elevators are products of forty-four years' specialization in school and college installations throughout the country. Numerous types, sizes and capacities are available to meet different requirements and conditions. The main uses are briefly described below.

Cafeteria Service

Food supplies, dishes and other cafeteria and kitchen loads are quickly and conveniently handled from floor to floor by means of SEDGWICK Dumb Waiters. SEDGWICK Type "FDCG" Geared Automatic Brake Dumb Waiters, "Sedg-Versal" Compound Geared Dumb Waiters and SEDGWICK Electric "Roto-Waiters" are employed for this duty, depending on individual requirements.

Class-Room Service

Books, stationery, crackers and milk lunches and general school supplies are systemically sent up or down by SEDGWICK Dumb Waiters without obstructing stairways with the handling of such loads. Sedgwick Type "FDCG" Geared Automatic Brake Dumb Waiters and "Sedg-Versal" Compound Geared Dumb Waiters are usually selected.

Dormitory Service

Furniture, trunks, laundry hampers and other bulky and heavy loads are carried from floor to floor by SEDGWICK Freight Elevators or "Sedg-Versal" Compound Geared Dumb Waiters used as trunk lifts.

Infirmary Service

The Sedgwick Hand Power Hospital Elevator provides an economical and unfailing means of carrying patient on stretcher or bed. Meal trays are handled by SEDGWICK Type "FDCG" Dumb Waiters.

Laboratory Service

Supplies and apparatus are safely and easily carried from storage or receiving room to laboratory floors above by "Sedg-Versal" Compound Geared Dumb Waiters conveniently located to save time and effort.

Laundry Service

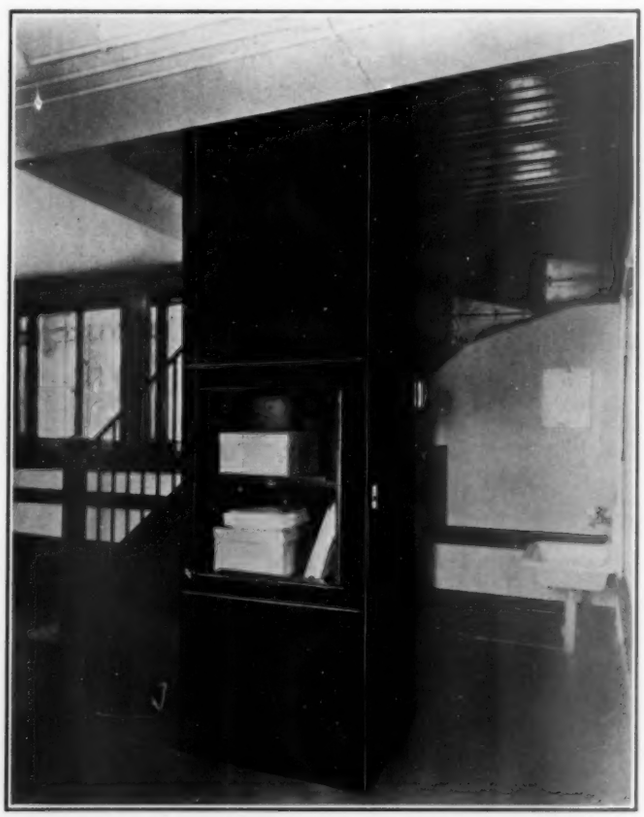
Laundry hampers and trucks are carried in many modern laundry buildings on SEDGWICK Freight Elevators, "Sedg-Versal" Compound Geared Dumb Waiters and SEDGWICK Electric "Roto-Waiters."

Library Service

Books can be sent without undue effort to the required stack levels or raised from basement storage space as required for distribution by using SEDGWICK Type "FDCG" Geared Automatic Brake Dumb Waiters or SEDGWICK Electric "Roto-Waiters."

Consultation

Our experience gained from many thousands of installations should be used in planning to best advantage installations of dumb waiters and elevators in school and college buildings. Write or telephone us for recommendations, layouts and specifications which will be gladly submitted at once.



"SEDGWICK Dumb Waiter in steel shaft using existing stairwell."

THE STANDARD ELECTRIC TIME COMPANY

Springfield, Mass.

BRANCH OFFICES IN PRINCIPAL CITIES

Manufacturers of

"Standard" Electric Time, Telephone and Fire Alarm Equipment Laboratory Current and Sound Distribution Systems

Master Clock

PROGRAM CLOCKS

For Schools, Industrial Plants, Public and Private Buildings.

"Standard" Electric Time equipment is precision made throughout, absolutely reliable and capable of rendering long service. Standard Master Clocks can be easily and quickly adjusted to meet any program changes that may be required. Program clocks are furnished in either tape or metal disc types. All master clocks are self-winding and built to control as many secondary clocks as are required for any building. Standard automatic hourly correction control assures accurate time in every room, thereby avoiding confusion and delay.

Secondary clocks are obtainable in a wide variety of designs to harmonize with any decorative scheme.

Wall phone with watch case receiver

TELEPHONE SYSTEMS

Consist of combination bell control board and central telephone station. Raising of receiver signals office. All conversations may be supervised if desired. May be installed in combination with program bells utilizing same signals and bells.

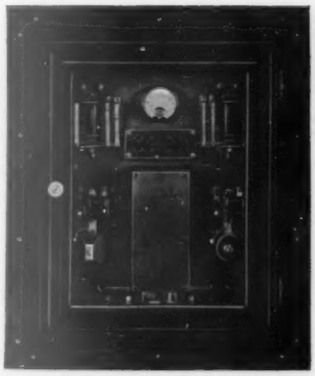
Dynamic classroom speaker service type with inclined front

RADIO AND PUBLIC ADDRESS SYSTEMS

Complete equipment to meet modern, present day educational requirements. Principals are enabled to broadcast announcements to individual classrooms or to all classrooms simultaneously. Outside radio programs of educational interest may be relayed to any or all rooms. Microphones may be utilized for assembly speakers, etc. A classroom supervising system can also be furnished with Standard Radio Equipment.

FIRE ALARM SYSTEMS

All "Standard" Fire Alarm equipment is designed and installed to meet the most exacting requirements and is approved by the National Board of Fire Underwriters. It is available in supervised closed circuit or open circuit types also with coded stations.



Closed circuit panel and cabinet

Tests can be made readily by opening any station with key. Various types of bell and horn signals are available. Systems may be furnished when so specified to be automatically tested each day from program clocks.

LABORATORY EQUIPMENT

Current Distribution for Physics, Chemistry, Biology, and Shop Departments.

Standard laboratory panels and accessory equipment are available in many designs and types to meet practically all laboratory requirements. The Standard laboratory voltage distribution systems conveniently distribute various voltages to tables and benches and are of inestimable value in every type of school laboratory. Exclusive features include jack construction, perfect contact, colored for ready selection in various voltages, sectional battery charging, and convenient table receptacles.

Wherever Standard laboratory equipment is in use there you will find a greater interest in scientific education on the part of the students.

Laboratory panel equipment with storage battery and motor generator

Established 1884

STANLEY & PATTERSON, INC.

Telephone
WAlker 5-0150

152 Varick St., New York, N. Y.

Cable Address
"ELECLIGHT"

DISTRICT SALES OFFICES

Atlanta, Ga.	Cincinnati, Ohio	Indianapolis, Ind.	Omaha, Neb.	San Francisco, Calif.
Baltimore, Md.	Cleveland, Ohio	Kansas City, Mo.	Philadelphia, Pa.	Seattle, Wash.
Birmingham, Ala.	Dallas, Texas	Los Angeles, Calif.	Pittsburgh, Pa.	St. Louis, Mo.
Boston, Mass.	Denver, Colo.	Louisville, Ky.	Rochester, N. Y.	Toledo, Ohio
Chicago, Ill.	Detroit, Mich.	Minneapolis, Minn.	Salt Lake City, Utah	Washington, D. C.

PRODUCTS

Program Clocks and School Signaling Apparatus, Signal Gongs, Chime Calls, Annunciators, Telephones, Fire Alarm Apparatus, Laboratory Panels, Hydro-Electric Emergency Current Supply Outfits, Telephone Power Supply Cabinets, Transformers and other Signaling Apparatus of every description.

CATALOGS AND BULLETINS

No. 49 Electric Signal Apparatus
" 46 Fire Alarm Systems and Apparatus
" 45 Telephone Systems and Apparatus
" 58 Laboratory Panels
" 66 Program Clocks (Bulletin)
" 70 School Signal Systems (Bulletin)
" 72 Hydro-Electric Emergency Current Supply Outfits (Bulletin)

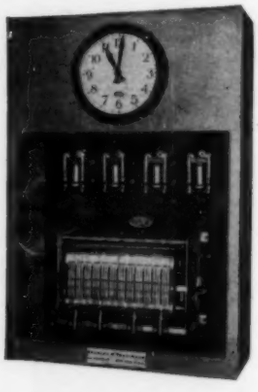
FARADAY DEVEAU PR

Trade-Marks

SYSTEMS

School Signal, Program Clock, Electric Time, Fire Alarm, Paging, Emergency Lighting, Intercommunicating Telephone, Tank Alarm, Sprinkler Alarm, Standpipe Pressure Signal.

PROGRAM INSTRUMENTS



Designed for use in schools, colleges, etc., to automatically sound bells, buzzers, chimes or horns on a predetermined schedule or schedules in the classrooms, yard or throughout an entire group of school buildings. Furnished regularly in 1, 2, 4, 6 and 8-circuit capacity, all of the 18-hour type, except 1-circuit clock is of the 24-hour type.

For full description and illustrations, write for Catalog No. 49.

SYNCHRONOUS MOTOR CLOCKS

Synchronous - motor - operated time systems are far superior to the old style pendulum master-clock and minute-impulse secondary clocks. Motor-operated clocks will year-in and year-out, keep correct time within $\frac{2}{10}$ of a second—an accuracy never obtainable in the pendulum-clock and minute-impulse dial systems. Furnished either single or dual-motored in a number of models. Write for Catalog No. 49.

FARADAY SIGNAL GONGS

Faraday signal gongs are manufactured with a full recognition of the necessity of absolute dependability to function perfectly at all times.

We have for many years specialized in the manufacture of signal gongs and can supply them in accordance with any specifications to meet normal or special requirements. Covered by Catalog No. 49.

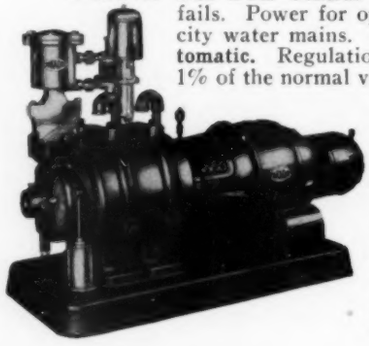
DEVEAU TELEPHONE SYSTEMS

DeVeau Telephone Systems vary, in accordance with the character and size of building, from a simple telephone-connection between two points to the most elaborate intercommunicating system operated with switchboard and outlying stations in and throughout a building or a number of separate buildings.

Intercommunicating Telephone Apparatus for institutions, schools, universities, etc., covered by Catalogs 45 and 49.

FARADAY HYDRO-ELECTRIC EMERGENCY CURRENT SUPPLY OUTFITS

Small, compact Hydro-Electric Generating Sets, built along the same lines as larger outfits. Automatically and instantly provide dependable current whenever that from Central Station or private plant fails. Power for operation is obtained from city water mains. Operation is **entirely automatic.** Regulation of frequency is within 1% of the normal value for operation of synchronous - motor clocks and program instruments.



Recommended for the following: Program instruments, Clock Systems, Program Bell Systems, Fire Alarm Systems, Emergency Lighting for Auditoriums, Emergency Lights for Exits. Bulletin No. 72.

FARADAY FIRE ALARM SYSTEMS

Faraday Fire Alarm Systems are designed with full consideration of the necessity that a fire alarm system must be absolutely dependable in operation and, at the same time, simple and economical both as to initial cost and maintenance.

They range from the simple, open-circuit system, employing small "break-glass" non - coded fire alarm boxes, to the most comprehensive doubly electrically supervised systems, with positive non-interfering code-ringing fire alarm boxes, giving automatically a maximum of protection. Covered by Catalog No. 46.

FARADAY CHIME CALLS

These new chime calls give a pleasing signal in a mellow musical tone. Made in six general types—

Single-stroke Bar Chime Calls
Pulsating Bar Chime Calls
Two-Note Bar Chime Calls
Bar Chime Calls in Combination with Bells and Buzzers
Resonator Chime Calls
Tubular Chime Calls

Made in ivory or black Duco or plated finishes.

Bar-Chime Call

THE HALSEY W. TAYLOR CO.

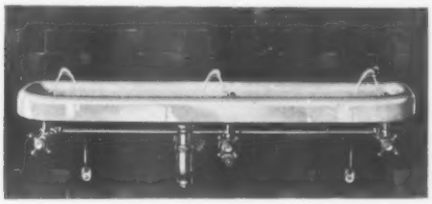
Automatic Stream Control Drinking Fountains

Warren, Ohio

OFFICES IN PRINCIPAL CITIES

Products of Specialization

Halsey Taylor Drinking Fountains are made and sold by the largest organization devoted exclusively to this line of manufacture. We aim to produce the best fountain for public or parochial school use, and invite school authorities and architects to write us on any problem concerning school drinking-water provision. Halsey Taylor fountains embody many distinctive features which promote sanitation, convenience and operating economy and service, some of which are briefly listed below; and can be had in wall, pedestal, recessed, semi-recessed and battery types:



No. 703

The Type Shown Can Also Be Had with Two or Four Heads

Ideal Drinking Mound

The Halsey Taylor two-stream projector is an exclusive feature which makes the side stream really practical, and removes the objections ordinarily found with sidestream types. It is an invaluable advantage where the health of children is concerned, as in school installations.

Absolute Sanitation

The drinking mound is formed by the converging of two streams of water, thus setting up an interference forming a localized drinking mound which makes it impractical to drink from any other point. Hence Halsey Taylor fountains are sanitary in the extreme. Fingers or lips cannot come in contact with or contaminate the source of supply. Squirting is impossible, hence children cannot tamper or play with a Halsey Taylor.

Floor-connected Pedestals

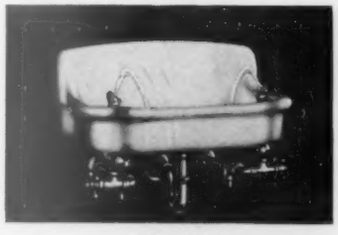
No. 568 No. 520

No. 2605

No. 2609

Vitreous China and Cast-iron Vitreous Enamel Fixtures for Every School Purpose

Vitreous China with Two Projectors



No. 2610

Highly Desirable for School Use

Practical Automatic Stream Control

An automatic device maintains a constant height in the drinking stream, even though line pressure may vary. The stream is never too high, never too low; always safe.

Write for New Catalog

This illustrated catalog details all the many popular models of Halsey Taylor fountains made for any building need, and especially school requirements. Send for it.

THE THOMAS-SMITH COMPANY

Canton, Ohio

BRANCHES IN PRINCIPAL CITIES

Electrically and Mechanically Operated Fire Alarm Systems
Electric Bells and Signals

Liberty Vibrating Bells Are of the Plunger Hammer Type. Nos. 6-Jr. D. C. and 7-Jr. A. C. Are Made in 3″, 4″, 5″ and 6″ Sizes, and Nos. 6 D. C. and 7 A. C. in 6″, 8″, 10″, 12″ and 14″ Sizes

Nos. 86 D. C. and 87 A. C. Combination Vibrating and Mechanical Bells Are Especially Adapted for Fire Signals. They Are Made in 8″, 10″ and 12″ Sizes

Nos. 811 D. C. and 812 A. C. Combination Single Stroke and Mechanical Bells Are Also Adapted for Fire Signals. They Are Made in 6″, 8″, 10″ and 12″ Sizes

PRODUCTS

Manually Operated Fire Alarm Systems;

Electrically and Mechanically Operated Fire Alarm Systems;

Vibrating and Single Stroke Bells for Direct or Alternating Current;

Combination Electrical and Mechanical Bells;

Aluminum Grids to fit all sizes of Bells;

Steel Housings for all sizes of Bells.

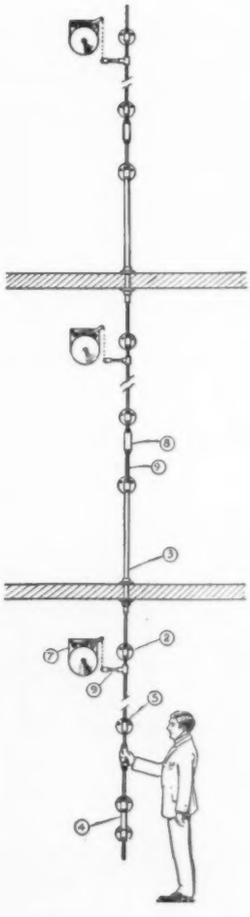
THOMAS-SMITH FIRE ALARM SYSTEM FOR SCHOOLS

(Illustrated at Right)

This manual fire alarm system for schools is approved by architects and conforms with state codes. It is the only system having a rigid rod connecting the alarms on the different floors of the school buildings. Other constructive features are:

1. Supports are adjustable to take care of uneven walls or misalignment of succeeding floors.
2. The floor tube is adjustable, to allow for floors of various thicknesses, and it extends up from the floor to prevent any obstruction in operation.
3. The spring is totally enclosed and positive in action.
4. All supports and tubes are bushed with brass, lacquered.
5. Finish is enamel. Colors, red, black or buff.
6. The bells are the best made.
7. The handles are of polished brass, lacquered.
8. The operating rod is a continuous steel tube, operating gongs on all floors simultaneously.
9. Wood mats are supplied for mounting supports and gongs.

Combination electrical and mechanical bells can be furnished with above fire alarm systems for operation with electrical ringing systems.



THOMAS-SMITH LIBERTY BELLS

Thomas-Smith Liberty Bells cover all types and sizes from 4-inch to 20-inch, vibrating or single stroke, 110 volt, 220 volt, all standard transformer voltages, battery operations, direct or alternating current. Weatherproofed types are furnished if desired at a small additional cost. All Thomas-Smith Liberty Bells embody the very finest workmanship and materials. Thomas-Smith Aluminum Grids are made to fit all sizes of bells. They fit snugly at the base of the mechanism over the shell and are bird-proof.

Write for catalog of Thomas-Smith Fire Alarm Systems and Liberty Bells.

Liberty Single Stroke Bells, Nos. 12 A. C. and 11 D. C. Made in 5″ to 14″ Sizes. Bells Contain no Springs Nor Moving Parts Except Plunger

UNITED STATES BRONZE SIGN CO., INC.

GENERAL OFFICES AND PERMANENT SAMPLE EXHIBIT

476 Broadway, New York, N. Y.

BRONZE TABLETS, MEMORIALS, LETTERS, SIGNS

Bronze tablets portray values of effort and accomplishment. Acknowledgments of service instill respect for high ideals. Bronze memorial tablets, plaques, historical markers, fraternity emblems, sculptured portraits, insignia and contest awards are available. Skilled artisans preserve standards of excellence making these products examples of leadership in quality and economy.

Thorough co-operation makes the purchasing of bronze tablets simple. Full size sketches in color are furnished free. Descriptions and drawings are rendered as work progresses. Tablets are solid castings of Everlasting Bronze. Special designs and sculptured portraits faithfully executed. This company's leading position is due to fine work and fair prices.

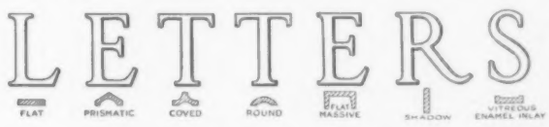
A beautiful bronze memorial demanding the highest artistic skill. Bas-relief portrait is sculptured after a photograph. Unlimited choice of decoration and arrangement of inscription. Any size, usually 24″ x 36″.

Bronze historical marker indicating use of scenic sculpturing combined with a society's emblem. Design originated by this company. Usual size 18″ x 24″. Adaptable to many purposes and longer inscriptions.

SMALL MEMORIALS

SPECIAL PLAQUES

Small Bronze Memorials in many designs. Shield and medallion shapes available for athletic and scholastic awards. Low in price, designed to your order.



Cast bronze individual letters and figures in all sizes for marking buildings. Classic and Architectural Roman styles emphasize the character of an educational institution.

Sketches and estimates prepared promptly, without charge. Comprehensive folder free. All inquiries given experienced attention.

A bronze tablet of rugged design. Particularly adapted for exterior use. The quiet dignity of this classic design is most appropriate for acknowledging endowments. This style has many modifications. Shown in dimensions of 30″ x 22″ any size available. Moderate cost.

OTHER IMPORTANT PRODUCTS OF THE UNITED STATES BRONZE SIGN CO., INC.

Administrative signs.
Bronze directories.
Bronze card holders.
Changeable bulletins.
Illuminated bronze signs.
Tablets for PWA projects.
Bronze, aluminum nameplates.
Engraved enameled signs.

UNITED STATES PLYWOOD CO. INC.

616–18–20 West 46th Street, New York, N. Y.

DISPLAY OFFICE: 103 Park Avenue, New York, N. Y.

BRANCH WAREHOUSES

Boston
Philadelphia
Baltimore
Brooklyn
Rochester
Detroit
Los Angeles
San Francisco

PLYWOOD

Manufactured in all woods such as Birch, Walnut, Mahogany, Maple, Oak and all other plain and figured woods in thicknesses from $\frac{1}{32}$" three-ply up to 2½" in all sizes in waterproof, semi-waterproof or commercial gluing.

OREGON FIR PLYWOOD

For partitions, concrete forms, underflooring, sheathing, general carpentry and vocational work. Cross grained laminations prevent warping or splitting—a fine, low-cost product.

WELDWOOD

Waterproof Plywood bonded with phenolic resins under heat for outdoor or technical uses.

FLEXWOOD

Fine wood mounted on cloth and made flexible for direct wall application in commercial and exotic woods. For auditoriums, reception rooms, entrance halls, libraries—where the dignified, restful beauty of wood is desired at minimum cost. (See illustration.)

ARMORPLY

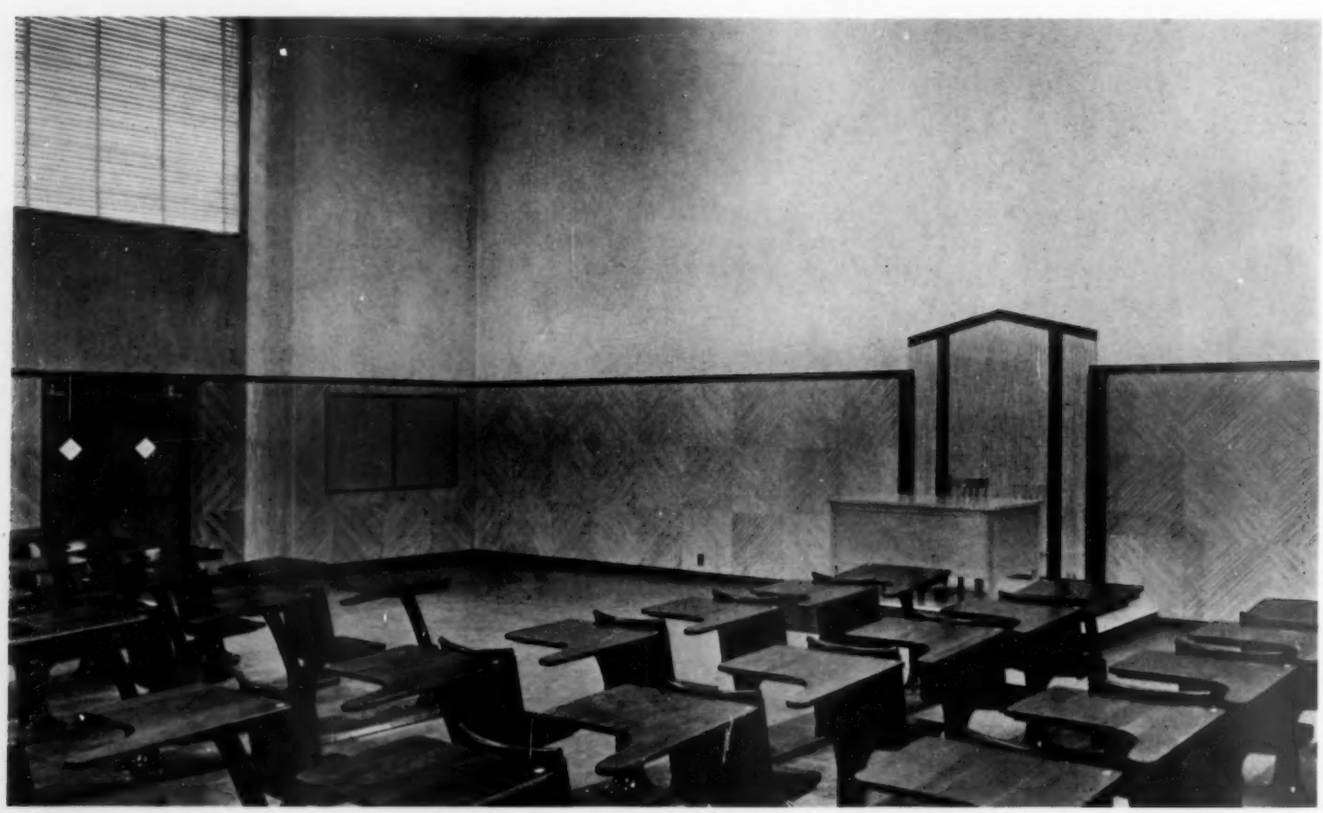
Plywood faced with metal of any kind for a multiplicity of uses—monel, copper, galvanneal, etc.

MICARTA

Decorative phenolic resin sheets for cafeteria table tops, bathrooms, wainscoting, etc. Either in sheet form or fabricated to specification.

PEWBACKS, SEATS, ETC.

Laminated construction in scientifically correct curved shapes in all woods.



Study Hall of Anaheim Union High School, Anaheim, California
Squares of Satinwood Flexwood

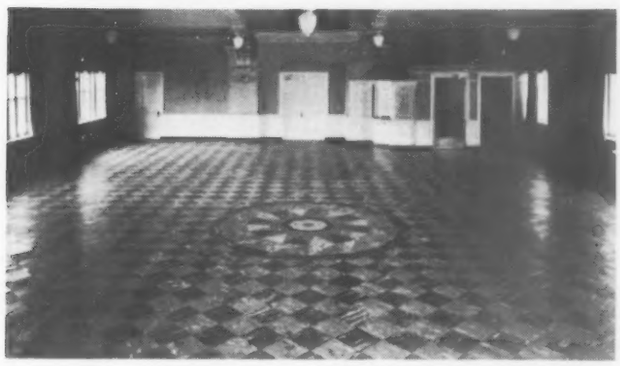
UVALDE ROCK ASPHALT CO.

San Antonio, Texas

Manufacturers of

AZROCK

CARPET TILE



ARCHITECTURALLY interesting is the fact that Azrock Carpet Tile so readily adapts itself to any surroundings. This is largely because of the variety of beautiful colors and textures which fairly invites the very design needed to emphasize the architectural intent. Azrock floor coverings, doing heavy duty in corridors, classrooms, recreation rooms and gymnasiums of the modern schools of America, has a cushiony resilience which subdues noise and adds to walking comfort; it is moisture proof, fire resistant, does not warp or crack and cannot be permanently damaged by burning cigarettes. For permanence the colors are uniform throughout the thickness of the tile. This enduring, long life tile is economical, practical and distinctly beautiful.

UNUSUAL FEATURES OF THIS BEAUTIFUL TILE

Azrock was perfected in the laboratories of the Uvalde Rock Asphalt Company and combines a durable toughness with superior resilience which easily conforms to both smooth and uneven floor surfaces without cracking or breaking under strain: can be laid successfully over wood floors or over concrete at or below grade without the use of expensive waterproofing or underlayments.

COLORS AND SIZES

A full line of colors both plain or marbleized makes color patterns practically unlimited. Azrock insulates against heat or cold and is likewise a nonconductor. Azrock Carpet Tiles are available in three thicknesses depending on type of subfloor and traffic, while many sizes are made to allow a variety of designs. The Uvalde Rock Asphalt Company also manufactures Azrock Industrial Tile for heavy duty. For further information and the name of the nearest distributing contractor write:

The Uvalde Rock Asphalt Company

General Offices

SAN ANTONIO, TEXAS

WARREN TELECHRON COMPANY

Manufacturers of Modern Timekeeping Systems for Modern Schools

Telechron

GENERAL OFFICE AND FACTORY
Ashland, Mass.

DISTRIBUTORS AND REPRESENTATIVES IN PRINCIPAL CITIES
In Canada: Canadian General Electric Company, Ltd., Toronto, Ont.

Low Initial Cost—Negligible Operating and Maintenance Costs

Double Face Metal Case Clock for Corridor

Telechron timekeeping equipment for grade schools, high schools, colleges, administration buildings, etc., includes single face clocks for classroom and office use; double face ceiling and wall suspension clocks for corridor use; marble and skeleton types for auditorium and foyer locations; single and multiple circuit program instruments for automatic control of class schedules; signal control boards for individual classroom signal control; classroom buzzers, corridor bells, and yard gongs; outdoor clocks for face of building or tower mounting; and central control equipment of manual or automatic type to permit control of an entire timekeeping installation from one central point.

Program Instrument for Operating Classroom, Corridor and Outdoor Signals

Each Telechron clock is a complete independent timekeeper equipped with a self-starting, sealed in oil, synchronous motor, the speed of which is controlled directly by the frequency of the alternating current to which it is connected. The alternating current frequency is in turn maintained by the aid of a Telechron Master Clock located in the central station of the local power company.

Round Metal Case Clock for Classroom

Telechron timekeeping equipment installed with central control may be of 115 volt or 24 volt type, depending on the exact requirements.

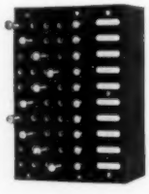
Powerful self-starting individual synchronous motor in each timekeeping device prevents scattering, and assures operation regardless of dust, dirt or vibration.

Recommendations to meet your particular requirements can be secured from your local Special Telechron distributor or by writing to the Warren Telechron Company, Ashland, Mass.—No obligation.

See 1937 Sweet's Architectural Catalog File for complete specifications

Marble Clock for Auditorium, Foyer, etc.

Automatic Resetting Device for Controlling ADMR (Automatic Dual Motor Resetting) Clock System



Combination Signal Control Board for Individual Classroom Signal Control

* *Telechron is the trade-mark, registered in U. S. Patent Office, of Warren Telechron Company.*

Dobbs Ferry Junior and Senior High School, Dobbs Ferry, New York, is equipped with a Telechron ADFR (Automatic Double Frequency Resetting) System consisting of 66 indoor clocks, program instrument, signal control board, 5 ft. outdoor clock and central control equipment. Installed October, 1935. Architects, Knappe & Morris, New York City. Engineers, Clark, McMullen & Riley. Electrical Contractors, Carroll-Ratner Corp., New Rochelle, N. Y.

WARREN WEBSTER & COMPANY

Camden, N. J.

Pioneers of the Vacuum System of Steam Heating
Branches in 60 Principal U. S. Cities—Established 1888

CENTRAL HEAT CONTROL FOR 22 COLLEGE BUILDINGS

Webster Moderator System at Mount Holyoke First Large Installation of Its Kind; Control-by-the-Weather

In 1934, Mount Holyoke College, South Hadley, Mass., completed an extensive modernization of steam using facilities, including a Webster Moderator System for central heat control of 22 existing buildings of various age and equipment, many one-pipe, some two-pipe and two hot water installations.

"Control-by-the-Weather" is provided by automatic Outdoor Thermostats, supplemented by a central control (shown at right below) including (a) lights to indicate functioning of control valves and accumulation of water in key radiators, (b) switches for remote shut-off, (c) Variators to increase or decrease steam delivery to any zone. This central control eliminates "cruising" of the campus by the operating force and permits observance of a definite operating schedule for each building.

A test demonstrated that the control system provides adequate facilities for effecting a 25 per cent reduction in heating expense. Further experience during 1935-36 has proved the value of the Webster Moderator System in effecting minimum steam consumption with minimum operating force and adequate heating.

While Webster Moderator Control has been employed for smaller groups of buildings, this is the first large installation of its kind. It has been inspected and commented on by many leading engineers and operators. Results warrant the prediction that coordinated central control of the heating of large institutional groups will rapidly supplant past methods of uncoordinated control of separate buildings.

The control contract was executed by Warren Webster & Company, under the direction of Clyde W. Colby and the Office of Hollis French, associated consulting engineers for the college authorities. Fred T. Ley & Co., was the general contractor. Steam fitting was done by Holyoke Valve and Hydrant Company, prominent Massachusetts heating contractors.

The installation was described recently in HEATING AND VENTILATING, leading technical publication, in an article entitled "Economy of Unique Control System Demonstrated at Mt. Holyoke College Plant." Reprints of this informative article will be furnished gladly to anyone interested in further details.

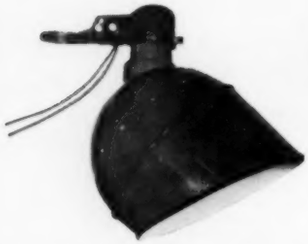
Central Heating Control at Mount Holyoke College

WESTINGHOUSE ELECTRIC & MFG. CO.

Edgewater Park **LIGHTING DIVISION** Cleveland, Ohio

Sales Offices and Locations in more than 110 Cities throughout the United States

Complete School and University Lighting Equipment



Type AFA-16 Open Type Floodlight with Cross-Arm Mounting Bracket

Type WS-8 Aqualux Underwater Floodlight

Lunalux or Sollux Plain Globe with Plain Semi-Rigid Hanger

Magnalux Ring Relief Basin with Standard Semi-Rigid Hanger

Interior Lighting

GENERAL ILLUMINATION of the finest type for schools is provided by Westinghouse Lunalux, Lunaire, Sollux and Sollaire lighting units.

Lunalux and **Lunaire** are semi-indirect luminaires, featuring single layer glass enclosing globes of dual density. Inefficient multiple layer glass and enamel coating are eliminated.

Sollux and **Sollaire** units provide direct lighting with globes made of the highest quality diffusing glass.

A chip-proof, flame-sealed fitter edge is provided on Westinghouse enclosing globes. Lunalux and Sollux globes feature the "Tilt-out" cap which permits easy replacement of lamps without removing globes.

Westinghouse enclosing globe luminaires are available in a wide variety of style and size combinations. Write for Cat. 61-260 and 61-270, and B-2081.

SIGHT SAVING ILLUMINATION, as well as quality general illumination, is provided by Westinghouse Magnalux.

Magnalux, an indirect lighting unit, sets the standard for modern, eye-comfort illumination. It combines efficiency with beauty, without the harmful effects of glare. Eye conservation results from Magnalux low surface brightness with adequate illumination. Many sight saving classrooms, university libraries and study halls are already enjoying the many benefits of Magnalux lighting.

Westinghouse Magnalux is available in a wide variety of styles and sizes to meet exact requirements and tastes. Write for Cat. 61-250, and DMF-5708.

Exterior Lighting

ATHLETIC FIELD ILLUMINATION with Westinghouse floodlighting equipment is a means to increased attendance and extended hours of play.

Westinghouse **Type AFA-16** open type floodlight with Cross-Arm mounting bracket provides the finest, most efficient floodlighting for football, baseball, and softball fields, tennis courts, and general sportsfield lighting.

The reflector is shaped to utilize the maximum output of the lamp, and is equipped with a large auxiliary reflector of Alzak aluminum for powerful beam on distant areas. The reflector is constructed of heavy sheet steel, porcelain enameled inside and out for dependable performance and longer life. A thumbscrew lock with wing nut makes the reflector easily removable from socket housing and mounting bracket, and assures safe locking and proper positioning.

For complete installation plans and construction details, write for Cat. 61-860, SP. 2066, F. 8369, and F. 8379.

SWIMMING POOL UNDERWATER LIGHTING with Westinghouse **Aqualux** floodlights prolongs the use of pools beyond the hours of daylight, insures safety to the swimmers and reveals the inviting beauty of sparkling water lighted from within.

For indoor and outdoor pools, Westinghouse makes available three types of Aqualux floodlights, Types WS-8, CS-14 and CS-16, to meet the exact requirements of pools of varying widths. Complete accessories, including wall receptacles designed for each individual type of unit, are also available.

For complete installation plans and construction features, write for Cat. 61-870 and F. 8373.

WOOD CONVERSION COMPANY

Manufacturers of

NU-WOOD Interior Finish . . . and BALSAM-WOOL Sealed Insulation

St. Paul, Minnesota

Made by the makers of Balsam-Wool, NU-WOOD is an interior finish that decorates—insulates—quiets noise—and corrects faulty acoustics, all in a single application and at low cost. Sturdy and lasting—easily cleaned—it is particularly adapted to use in school and college classrooms, study halls, corridors, auditoriums, cafeterias, lunchrooms and offices. Nu-Wood has won an enduring place for itself in schools, colleges and universities because it fills several vital school needs—not just one or two.

In the classroom above, Nu-Wood Tile on the ceiling and Nu-Wood Plank on the walls bring beauty and quiet at low cost

Nu-Wood has a softly textured surface and is available in a variety of colors. In addition, it is manufactured in the form of Tile, Plank, Board, Wainscoting and Moldings, thus making possible an almost unlimited choice of pattern combinations as well as individual selection of decorative effects.

In school modernization, Nu-Wood is applied directly over the old wall and ceiling surfaces. In new construction, it provides a permanent interior finish that meets every test of school use. Application, either in existing buildings or in new construction, is simple and easy.

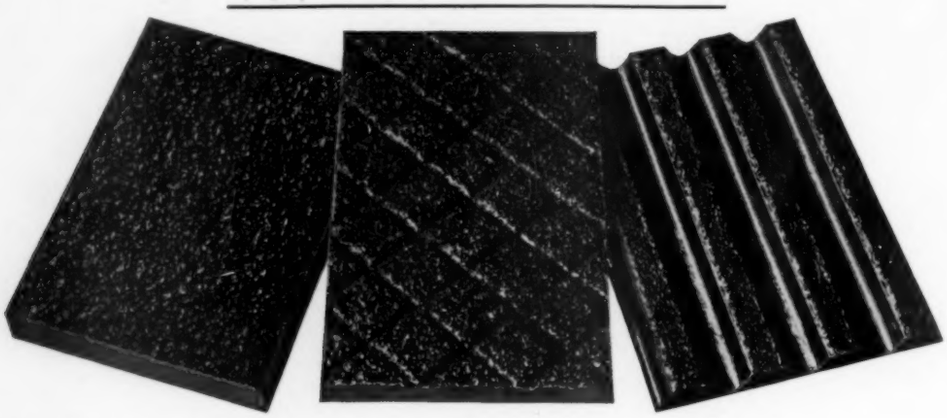
Complete details on Nu-Wood, together with illustrations showing its use in school buildings, will be sent gladly on request.

WOOSTER PRODUCTS INC.

Wooster, Ohio

New York Office: 101 Park Ave. Chicago Office: 324 W. Washington St.

REPRESENTATIVES IN ALL PRINCIPAL CITIES



WOOSTER SAFE-GROOVE TREADS—Steel Base, Yellow Brass Base, White Alloy Base.
WOOSTER ABRASIVE CAST TREADS—Ferrogrit, Alumogrit, Bronzogrit, Nicklogrit.

Stairs Must Be Safe and Durable

Wooster Safety Treads eliminate the slipping hazard on smooth, worn and hollowed out stairs; they eliminate wear and tear on the original walking surface of stairs and prolong indefinitely the effective life of the stairs.

Safety Treads for New Construction

New stairs of any material, protected with Wooster Safety Treads will outlast by many years stairs lacking such protection. If the treads ever wear out, they are easily and economically replaced. In addition, they provide a greater degree of anti-slip efficiency than that of any other material ordinarily used in stairway construction.

Safety Treads for Repair

Wooster Safety Treads afford a most efficient means of repairing, renewing and modernizing old, badly worn stairs at moderate cost. The work can be done by any mechanic, or the custodian. Because of the great variety of standard types, you can find in Wooster's complete line exactly the right type of safety tread for any purpose.

Wooster Safe-Groove Treads, shown at the right in the above illustration, are made in steel, brass or white alloy (a hard, heat-treated aluminum alloy) base with ribs of abrasive grits, or lead anti-slip.

Wooster Abrasive Cast Treads are made of cast iron, cast aluminum, cast bronze and cast nickel bronze, having abrasive grits firmly and securely embedded, at time of casting, to provide a slip-proof surface of unusual durability. Many styles are available; treads are cast in any size according to specifications.

Wooster Security Nosing

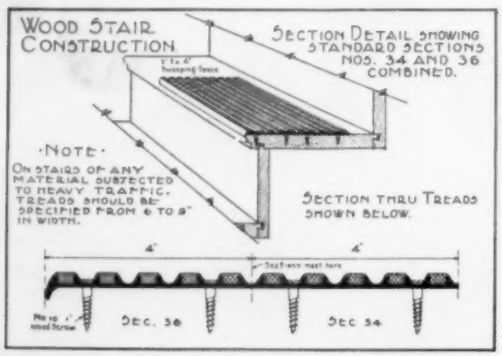
Made of solid extruded Yellow Brass or White Alloy Metal to protect exposed edges of floor coverings on stairs and to prolong the life and appearance of the material. Widely used with linoleum or rubber for covering table, counter or desk tops. Made in a variety of new, ultra-modern designs; highly decorative; resistant to acids and chemicals. Write for illustrated price list.

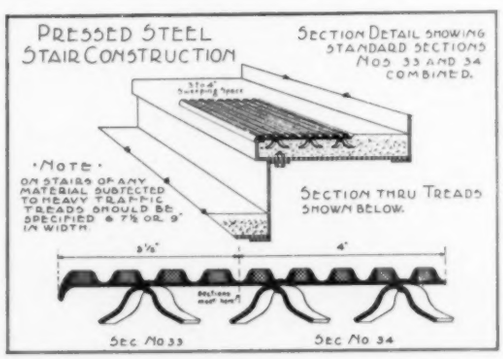
Wooster Security Edging

Protects the edges and enhances the appearance of rugs and runners of linoleum, rubber, etc., in classrooms, dormitories, halls and corridors. Used with same materials in renovizing tops of tables, desks, cafeteria counters, etc. Made of solid extruded Yellow Brass or White Alloy Metal. Highly resistant to acids or chemicals. Write for illustrated price list.

Wooster Metal Mouldings

A beautiful, thoroughly modern metal trim for use with modern wall covering materials such as Linoleum, Rubber or Asbestos Tile, Plywoods or Hardboards. Simplifies and facilitates installation of either flexible or rigid materials. Suitable for use in Dormitories, Classrooms, Offices, Auditoriums, Cafeterias, Kitchens, Bathrooms, etc. Made of solid extruded White Alloy Metal, or Stainless Steel. Standard finish is Woosterlite, a brilliant, mirror-like surface resembling chromium, or a satin finish of silvery white. Also available in seven colors. Write for illustrated price list.


WOOD STAIR CONSTRUCTION
SECTION DETAIL SHOWING STANDARD SECTIONS NOS. 34 AND 36 COMBINED.
·NOTE·
ON STAIRS OF ANY MATERIAL SUBJECTED TO HEAVY TRAFFIC, TREADS SHOULD BE SPECIFIED FROM 6 TO 9" IN WIDTH.
SECTION THRU TREADS SHOWN BELOW.
4"
4"
SEC. 36
SEC 34


PRESSED STEEL STAIR CONSTRUCTION
SECTION DETAIL SHOWING STANDARD SECTIONS NOS 33 AND 34 COMBINED.
·NOTE·
ON STAIRS OF ANY MATERIAL SUBJECTED TO HEAVY TRAFFIC TREADS SHOULD BE SPECIFIED 6 7½ OR 9" IN WIDTH
SECTION THRU TREADS SHOWN BELOW.
4"
SEC NO 33
SEC NO 34

SECTION III
OPERATION AND MAINTENANCE

THE DISTRIBUTION OF PUBLIC SCHOOL SUPPLIES

BY R. W. HIBBERT

Director, Books—Supplies—Equipment,
Board of Education, St. Louis, Mo.

THE question of distribution of equipment and supplies has so many possible divisions that a discussion of all phases would not be practical. I shall attempt, therefore, to touch upon only a few outstanding problems of management in this paper.

The Central Storehouse

The practicability of the central storehouse is understood not only by many school executives but by laymen also, as is shown in a statement of N. Bradford Trenham, representative of the California Taxpayers' Association, who writes:

> "The most important yardstick in the purchasing phase of business administration is the unit cost of supplies. . . . The cost per pupil and the volume per pupil are useful yardsticks. The cost of administration of the purchasing department is somewhat of a check on its efficiency." [1]

We will assume for the present that there is then a school size for which the central storehouse plan is practical and economical. It is the expectation of the writer that this size will soon be fairly definitely established through research. All school administrators should be conscious of the advantages of the central storehouse plan. Under this plan it is proposed that all supplies used by a majority of teachers be stocked in a central storeroom, and that purchases when made be delivered to this location. The plan includes deliveries to schools or rooms on a periodic basis to fill orders coming from the school principal or teacher and chargeable to the respective room, activity, or school. With this plan in vogue, the following advantages present themselves:

1. *Estimating Needs.*—The first of these advantages is the possibility of a better estimate of supplies needed when annual purchases are made. Purchasing estimates can be more accurately calculated with the following factors as a basis when records of purchases and deliveries are systematically kept:

a. A comparison of stock on hand at date of estimate with stock on hand at same date for several preceding years.

b. Amounts of the particular item which has been used for the current school year to date of estimate compared with a like period for previous school years.

c. Stock purchased for delivery to central storehouse for the year preceding the estimate, as compared with purchases for previous school years.

d. Any new activity to be undertaken or any increase or decrease in present activities which may cause an increase or decrease in the particular item to be purchased.

2. *Fulfillment of Contracts.*—When purchases are made on the basis of a sample selected by an instruction department committee, the question often arises whether the delivery by the vendor is in accordance with the accepted sample. The central storehouse plan as proposed permits a check of deliveries to ascertain that quantity and quality compare with the item which the vendor has previously proposed to furnish.

3. *Systematic Control.*—A more systematic control is available when deliveries are made to schools from a central source. A continuous record of distribution charges may be kept on file to indicate the quantity of the material used by each school, activity, or department. Such a plan permits a control warning to be sounded when stocks indicate that usages are apparently increasing.

[1] "Yardsticks and Barometers for Measuring Efficiency of School Business Administration." Proceedings, National Association of Public School Business Officials, 1932, p. 175.

4. *Minimum Stock Requirements.* — When each school building is a storeroom unto itself, certain amounts of reserved stocks are necessarily larger. The percentage of necessary reserved stock is less and can be used more advantageously when supplied from a central source. This makes possible smaller stocks in the classroom, and therefore a guarantee that fresher, cleaner, and better-cared-for stock will be used. Along with this is the possibility of decreased cost of storage where special shelving or special bins are required. If these were required in each school to care for small quantities of special materials, it will be apparent how this factor in itself could increase the costliness of the individual item and therefore of the educational activity. (See discussion of periodical delivery plan, on page 155.)

5. *Elimination of Hoarding.*—We have heard many things regarding hoarding in private and governmental processes. This also applies to schoolroom supplies. If the central storehouse had no other advantage than the prevention of hoarding on the part of any schoolroom or activity, it would justify its existence on this point alone.

6. *Uniform Supply for Uniform Instruction.*—It is possible to increase purchasing costs of supplies by increasing specifications to include many multiplicities of kindred items. If this is allowed to run rampant, it has been noted, schools within a school system vary with their desires and demands for the fulfillment of the same curriculum objective. It has also been noted that where these desires are standardized, results of the same quality may be obtained. The central storage insures uniform supply for uniform instruction.

7. *Lower Costs.*—Lower purchasing costs result from this plan because of the elimination of selling costs, necessary in some school systems where the salesmen must visit the individual principal and sell for the needs of each school. The latter kind of selling does not permit of competitive bids or a systematic selection on the basis of a standard procedure. Lower costs are further made possible because greater quantities of particular supplies of one kind are purchased and used, instead of various types of the same item for the same purpose.

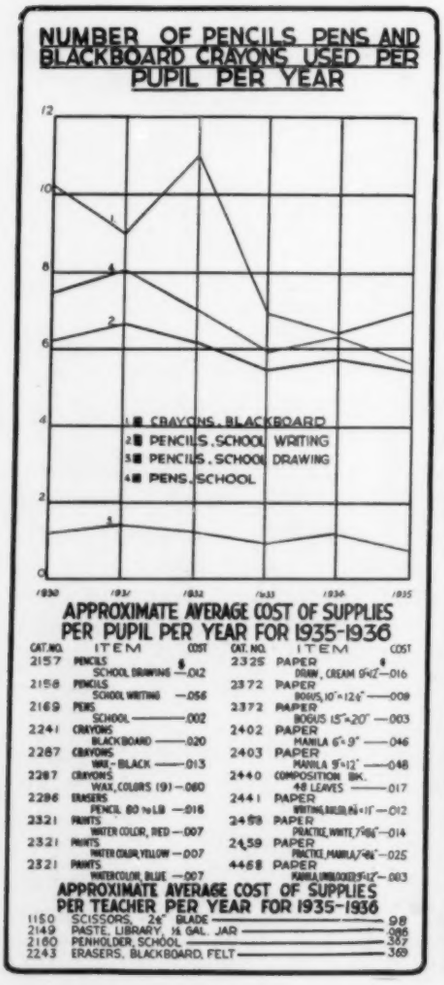

NUMBER OF PENCILS PENS AND BLACKBOARD CRAYONS USED PER PUPIL PER YEAR
1 CRAYONS, BLACKBOARD
2 PENCILS, SCHOOL WRITING
3 PENCILS, SCHOOL DRAWING
4 PENS, SCHOOL
APPROXIMATE AVERAGE COST OF SUPPLIES PER PUPIL PER YEAR FOR 1935-1936
APPROXIMATE AVERAGE COST OF SUPPLIES PER TEACHER PER YEAR FOR 1935-1936

Fig. 1

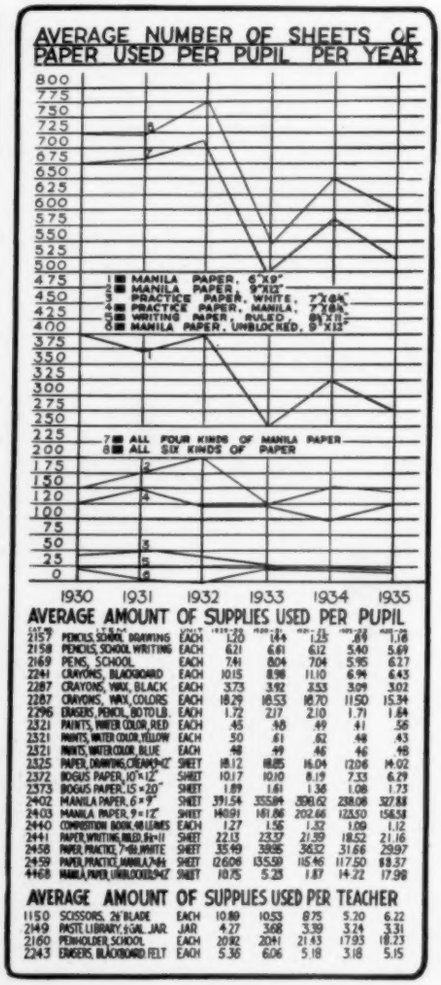

AVERAGE NUMBER OF SHEETS OF PAPER USED PER PUPIL PER YEAR
1 MANILA PAPER, 6"X9"
2 MANILA PAPER, 9"X12"
3 PRACTICE PAPER, WHITE, 7"X8¼"
4 PRACTICE PAPER, MANILA, 7"X8¼"
5 WRITING PAPER, RULED, 8½"X11"
6 MANILA PAPER, UNBLOCKED, 9"X12"
7 ALL FOUR KINDS OF MANILA PAPER
8 ALL SIX KINDS OF PAPER
1930 1931 1932 1933 1934 1935
AVERAGE AMOUNT OF SUPPLIES USED PER PUPIL
AVERAGE AMOUNT OF SUPPLIES USED PER TEACHER

Fig. 2

School Supplies— Average Costs

School costs can well be illustrated by the accompanying diagram, Fig. 1. The chart indicates the quantity usage of four of the most common schoolroom supplies. The unit of usage in each case is an individual item.

Table 1 indicates the cost of other elementary school supplies for the years included.

TABLE 1

AVERAGE COST PER PUPIL
Elementary Classroom Supplies

Year	Cost
1929-30	$1.34
1930-31	1.21
1931-32	.98
1932-33	.68
1933-34	.70

The cost per pupil for supplies, when they are purchased in quantities, is indicated in the table below the chart (Fig. 1). The amount of money indicated represents the cost of each supply used in an average year, based upon a six-year study as illustrated. By a careful consideration of costs per item, as illustrated, one can determine for each individual school

system what the parent taxpayer saves when the school board supplies school needs through the central storehouse plan, over what his per-pupil cost for supplies develops to be when each parent purchases the individual pupil material.

A Periodic Delivery System

In considering the number of deliveries to be made from the central storehouse, so as to secure the best service for the system, there should be a careful study of the conditions affecting the particular school system. The quality of service rendered will depend upon an intimate knowledge of the variable factors involved: (1) size of storerooms in the individual school buildings; (2) size of the storage closets in the classrooms; and (3) the facilities for the transporting of supplies and equipment from the central storehouse. These cannot be disregarded in the solution of this problem.[2]

A. The division of any school system into delivery routes is the first essential requirement of such a plan, as illustrated in Fig. 3. The schools, grouped in accordance with the most advantageous transportation plan, can each be listed under the respective route number and a publication issued in bulletin, card, or other convenient form, so that each school principal may know to what route his school has been assigned.

B. Requisitions can be requested for each route for a specific date each month, and the required dates staggered to give time for checking and route packing. Requisition data should be included in the routing publication.

C. Route loads can be placed on delivery trucks in the late afternoon previous to the delivery date. In this way, all packing done during the day can be cleared away, the trucks can be loaded at a time when it is not advantageous for them to be at schools, and they are ready for early morning starts.

D. Special needs which cannot be anticipated may be served by a call-and-carry delivery system. In such cases, schools must call for such items needed or a portion of the quantity necessary to last until the route delivery is made. It is not found necessary to resort to this plan often, however, when the order date procedure is followed by principals, as illustrated in Fig. 2.

Quantity Usage of School Supplies

A six-year study of the average quantity of six types of paper furnished to pupils in the St. Louis public schools is shown in Fig. 2. The unit in each case is a sheet of paper. The chart indicates that in 1932 each elementary school pupil was supplied with 775 sheets of paper for the school year. In 1935 an average pupil was supplied with 600 sheets of paper for the school year. No attempt has been made to predicate that this number is accurate enough to use in establishing school quotas. The chart does portray, however, the possibility of the teacher's reducing usage of supplies.

The average usage of some of the more widely used elementary schoolroom supplies is shown in the table below the chart (Fig. 2). In each case the calculation has been made for approximately 100 elementary schools with an elementary school enrolment of approximately 80,000 pupils. The unit usage is indicated in the proper column.

Equipment Quota

Controlled experimental studies, having as their objective the determination of quality and quantity of equipment and supplies required, should be continuous. The quota sheet, revised annually on the basis of school needs and budgetary possibilities, is the first available asset in equipment placement control. With such an established standard, little or no objection should be raised by any school to releasing material when its need is indicated elsewhere, and such transfer has a pronounced economy value.

Be sure your orders are in on the proper dates!! You are listed in one of the routes below.

SCHEDULE OF DELIVERY FOR SUPPLIES
EFFECTIVE SEPT. 1st, 1923
SUPPLY DEPT. 3631 SCHOOL STREET
BOARD OF EDUCATION OF THE CITY OF ST. LOUIS, MO.

This schedule is for "stock" items shown in your catalog. c. 4 is applicable to the "Unit" system only.

Effective Sept. 1, 1923, Supplies will be delivered to the Schools on a basis of Three (3) Times each Month. To carry such a program to a successful conclusion, the Schools have been divided into six (6) sections or routes with specific order days or the Schools embraced in each division. Requisitions will not be filled unless they are in the Supply Dept. on or before the day they are due. Late requisitions will be held over until the next regular order day. All deliveries will be made within approximately five days from date of order day. When requisition "due" date falls on a Sunday or a holiday, the requisition is due the day previous

ROUTE No. 1 — Schools from which Requisitions are due on: 1st, 10th, 19th

Charless, Chouteau, City Hospital No. 1, City Hospital No. 2, Clinton, Clinton Branch, Com. Minors, Dumas, Eads Ave., Fremont, Garfield, Hodgen, House of Detention, Humboldt, Lafayette, Lincoln, L'Ouverture, Madison, McKinley, Monroe, Peabody, Pestalozzi, Shepard, Sigel, Special No. 1, Special No. 6, Waring, Waring Branch

ROUTE No. 2 — Schools from which Requisitions are due on: 2nd, 11th, 20th

Blow, Carondelet, Cleveland, Delany, Des Peres, Froebel, Gallaudet, Gallaudet Annex, Grant, Gravois, Harris Teachers College, *Koch Hospital, Lyon, Meramec, Mt. Pleasant, Resident Open Air, Roosevelt, Scruggs, Shenandoah, Special No. 5, Special No. 7, Special No. 8, Taussig Open Air, Test and Measurements, Woodward, Wyman

ROUTE No. 3 — Schools from which Requisitions are due on: 3rd, 12th, 21st

Adams, Buder, Canterbury, Dewey, Fanning, Gardenville, Gratiot, Kennard, Lindenwood, Long, Longfellow, Mann, Mason, Michael, Mullanphy, Oak Hill, *Ridge Farm, Rock Spring, Roe, Shaw, Sherman, Shriner's Hospital, Stix, Special No. 11, Special No. 13, Wheatley

ROUTE No. 4 — Schools from which Requisitions are due on: 4th, 13th, 22nd

Arlington, Benton, Blewett, Clark, Cote Brilliante, Cottage, Cuppies, Dozier, Emerson, Field, Hamilton, Hempstead, Laclede, Marquette, Marshall, Porter Open Air, Riddick, Simmons, Soldan, Sumner, Sumner Teachers College, Special No. 2, Special No. 10, Washington, West Belle

ROUTE No. 5 — Schools from which Requisitions are due on: 5th, 14th, 23rd

Ashland, Baden, Bates, Beaumont, *Bellefontaine, Bryan Hill, Bryan Hill Manual Training, Columbia, Eliot, Farragut, Garneit, Glasgow, Harrison, Irving, Lowell, Mark Twain, Montgomery, Montgomery Boys, Museum, Penrose, St. Louis Ave. Boys, Scullin, Special No. 3, Special No. 9, *Special No. 14, Walbridge, Walnut Park, Wells, Yeatman

ROUTE No. 6 — Schools from which Requisitions are due on: 6th, 15th, 24th

Ames, Banneker, Blair, Board Bldg., Carr, Carr Lane, Central, Clay, Crow, Dessalines, Divoll, Douglas, Franklin, Henry, Howard, Jackson, Jefferson, O'Fallon, Special No. 4, Special No. 12, Webster

*Deliveries not guaranteed

Fig. 3

[2] N. B. Armstrong and others, Bulletin No. 1. N.A.P.S.B.O., p. 45.

The Supply Clerk

Probably every school system of fifty or more teachers should have a supply clerk. The duties assigned would of necessity vary with the size of the community. It is proposed that in the larger cities supply clerks be assigned to duty in the schools, independent of the central purchasing department. The assignment of such assistants will prove profitable because of the help given to those responsible for administration. Among other duties, this administrative supply clerk would assist greatly in the following:

1. In checking deliveries, from the central storehouse and from vendors. This check pertains more to quantity; quality can better be checked by the purchaser. In many cases, return deliveries are necessary, or transfers. Much confusion is occasioned when no one in a school has this direct job as a duty.

2. A well-kept school storeroom is essential, and without a clerk in charge this is rare. The storeroom should be arranged systematically, with perhaps a chart of places assigned for certain supplies.

3. In most schools the equipment inventory is a problem. To a commercial business the accurate inventory is an outstanding necessity, and so it should be to the schools. It can be better supervised by the supply clerk.

4. Estimates of supplies coming from a school to a purchasing department should be accurate, concise, and uniform, to afford ease of handling. Where a supply clerk is not accessible, however, this is not often the case, and many errors and omissions occur.

5. Requisitions should be accurate and uniform, but still we find teachers and principals who assume that the department of purchase can guess what is desired, and sometimes fail to state concisely what delivery should be made or what service should be rendered. Again, a trained supply clerk could place requisitions accurately and so avoid delays, confusions, and waste.

6. It has been reported in many cases that a teacher ordering some equipment or supplies does not receive them although records indicate delivery to the proper school. This happens when orders and deliveries do not come through the same channel in a school. Again the supply clerk would straighten out this kind of mismanagement.

7. In other cases a distributing agency would permit the use of school material by a maximum number of teachers. At times, two teachers may require the same item; if through a plan and distribution the use can be arranged for at different times, it is evident that a saving results. Someone must care for this coordination; the supply clerk is the logical person.

Other duties and responsibilities might be called to your attention, but these will suffice to indicate that a supply clerk can quite profitably serve in the problem of the proper distribution of public school supplies.

The Salvage Room

Teachers and principals should cooperate in the matter of sending all excess supplies and equipment to the central storehouse. Some of this material will be unfit for further use. Some will be in need of repair, and some can be sent to other schools as it comes in. If all such material is sent to a sorting and salvaging room, it can more readily be put to profitable usage. The obsolete and badly worn material should be immediately condemned. The usable material should be stocked in accordance with its catalog number, and that which can be repaired should be held for future needs.

While many phases of supply management might be discussed in length, the writer chooses to conclude this paper after calling attention to the few selected, since he believes that these are the questions which are seldom called to the attention of school administrators, and are in reality the problems which should be brought to light most often.

FIRE INSURANCE ENGINEERING SERVICE

How It Can Be Used to Secure Reduced Premium Costs

BY CARL REGER AND A. K. BRAKE

Consulting Architect and Insurance Engineer, respectively, of the West Virginia Fire Insurance Service Bureau, Buckhannon, W. Va.

A VERY general idea exists on the part of building owners, including many school officials, that there is some inevitable finality about fire insurance rates, like death and taxes; that nothing much can be done to escape insurance costs except by canceling insurance or by purchasing cheap, cut-rate insurance. In many sections the idea prevails that the establishing of fire insurance rates is a function of the state government, that the work is done by "state inspectors," just as property tax assessments are made by public officials, and that while a building owner may feel his rates are unjust, there really is scarcely anything he can do about it.

The average owner understands about his insurance companies and their local agents. What he does not understand, and what a great many local agents are unable to explain to him, is the vastly complicated and mysterious working of the rate-making machinery that has been slowly developed by the insurance companies into what now exists as The National Board of Fire Underwriters, the various actuarial bureaus, several widely different rating schedules, and the numerous rating bureaus operating all over the country. It is but natural that a huge and universal business, such as the underwriting of fire losses has become, should jealously guard the price-fixing machinery and its operating processes, on the theory that what the policy-holder doesn't know in this regard won't hurt him.

In this short article it will not be possible to treat this subject in detail, but it may bring some enlightenment to school administrators harassed with the ever recurrent bills for fire insurance, which may run anywhere from $1,000 to $10,000 annually on each million of insurance. This very difference in premium cost creates a lively question in the policy-holder's mind; he cannot understand how any just and equitable system of rate making can produce such widely different results, even after making allowance for differences in hazards which he can understand.

The Basis of Rate Making

Who make the rates? How do they do it? And how can the policy-holder get at this matter in a way that will at least leave him satisfied that he is getting a fair deal, instead of feeling that he has been directed up blind alleys which have been created perhaps just for the purpose of frustrating and discouraging him in any attempt he makes along this line? These are questions ever present in the minds of thoughtful property owners.

The National Board of Fire Underwriters is maintained by joint action of the insurance companies, to keep records, make tests, and establish standards; it is the companies' research department.

Rating schedules, to be used in establishing insurance rates on buildings, are largely based on findings made by the National Board of Fire Underwriters. These schedules are not uniform throughout the United States; they vary widely in principle and in ultimate results in different localities. Of these schedules, the Dean Analytic Schedule is used in about half of the states, including New England, Central and Middle Western territory. Eastern and Southern territories are operated on other various schedules. All these schedules are made to "fit" as much as possible the territories where used. Organizations using these schedules to establish rates are known as rating bureaus or inspection bureaus. They usually are private organizations, to which the fire insurance companies subscribe for rate service in the various territories. Methods vary in different states, but Ohio may be taken as a typical illustration.

A standard "old line" stock fire insurance company applies to the Ohio State Insurance Department for license to operate in Ohio. With this application it files a statement that rates fixed by the Ohio Inspection Bureau will be used. Permission having been granted to do business, the company is required by law to charge these published individual rates; no more, no less. A "cut rate" stock company or a mutual company may file a statement showing that it will charge Ohio Inspection Bureau rates less 20 per cent; this being granted, it must charge on that basis; no more, no less.

The Ohio Inspection Bureau is required to file with the State Insurance Department its rating schedules, showing charges and credits to be used in making rates, and under the law is required to follow these schedules which have been thus filed and approved.

In Ohio the Dean Analytic is used, together with various auxiliary and special schedules which have been found necessary to meet Ohio conditions.

Rating Procedure

The universal starting point for any rating schedule is the degree of municipal protection against fire which the building enjoys. For this purpose, the National Board of Fire Underwriters has classified the towns and cities under Classes 1 to 10, in which Class 1 has the most nearly perfect rating, and Class 10 has no municipal protection at all. In Ohio and West Virginia, for instance, Cleveland and Cincinnati are in Class 3; Columbus, Toledo, and Parkersburg are in Class 4; Steubenville, Charleston, and Wheeling are in Class 5. Basis tables have been worked out for frame, brick and fireproof buildings; the basis on each starting with a one-story building under Class 10, with credits for each additional degree of class protection and with charges usually for each additional story height. Under the Dean Analytic Schedules, after the basis rate on a building has been established, charges and credits are for the most part worked out on a percentage basis. Typical rating procedure is as follows:

A Board of Education wishes to place insurance on a new school building. Its insurance agent finds no published rate on the building and he applies to the Inspection Bureau for a rate. The Bureau's inspector visits the building, and on blank survey forms prepared for that purpose the inspector makes note of each item of construction and occupancy affecting the rate; from the data thus secured, rates on buildings and contents are computed later by the inspector in the office of the Inspection Bureau and published in the form of a bulletin or on a rate card which is sent to each agent in that territory who is entitled to rate service. This rate having been established, it may continue unchanged for many years; on the other hand, it may soon be changed owing to re-rating of the building.

Changed conditions which may call for re-rating are numerous. Additions or alterations to the building may either increase or decrease the chargeable hazards. Changes in occupancy such as new or increased features in the various industrial arts, or increased stage equipment, may increase the rates. Discontinuance of such activities and removal of equipment brings a corresponding decrease. Exposure charges from adjacent structures frequently change. Also, there are frequent changes in the schedules which sometimes raise and sometimes reduce rates. Any change in the classification of the city is automatically reflected in the individual building rates.

Thus, these rates are constantly subject to change, up or down. If it were only a matter of correct schedules correctly applied, the situation would be ideal, with each building at all times paying its correct share of the nation's fire loss.

Now, what can the average owner or school board do about insurance rates? Obviously, he can do practically nothing regarding schedules. The machinery developed by collective action on the part of the Underwriters for schedule-making purposes is vast and complicated; the resulting schedules are based on data compiled over many years and from countless sources. Any attempt, for instance, to show that the schedules applying to school buildings are incorrect would have to be backed up by some large organization; in fact, by many organizations, having extensive and well-organized facilities for collecting and classifying the necessary data.

But there is considerable the average owner can do regarding the application of these schedules to his individual buildings. The West Virginia law is typical:

> "Every rating bureau engaged in making rates on property located in this state shall inspect every risk specifically rated by it upon schedule and shall make a written rating survey of such risk which shall be filed as a permanent record in the office of such bureau. Rates for insurance on all property rated upon a flat-rate basis shall also be filed in such office. A copy of such survey shall be furnished without cost to the owner of any risk upon his request."

Thus, an owner can secure for himself, or by a letter of authority can authorize his insurance agent or technical expert to secure, copies of the rating bureau's surveys showing just how his particular rate was computed. These figures being available, a general check-up can be made of the entire rate calculation. These surveys, and the schedules upon which they are based, are so technical and so complicated, however, that both the owner and his insurance agent are practically helpless except perhaps for a few so-called after-charges which usually are of minor importance. Only a technical schedule expert, constantly up to date on schedule matters, and with first-hand knowledge of the schedules *per se*, can secure for the owner the real meat in the rate surveys.

Under the Dean Schedule, there are three general classes of charges applying to buildings:

Structural charges relate to kind and thickness of walls, construction of floors and roof, elevator shafts, stairways, skylights, fire escapes, height, fireproofing of beams and columns, etc.

Occupancy charges relate to the hazards due to the various occupancies and the activities incident thereto. A barber-shop occupancy carries a low charge; a mattress factory occupancy carries a high charge. The varying conditions reflected in occupancy charges are seemingly endless.

Exposure charges are those due to hazards from adjacent or nearby buildings, and are computed from formulae based on the individual rate and size, construction and occupancy of the exposing buildings; reductions in exposure charge are made according to distance between buildings, types of

openings in exposing and exposed walls, etc.; in short, the exposure charges are subject to a very precise check-up of all conditions outside and surrounding the building rated.

In addition to the above, there are after-charges in varying amounts for miscellaneous hazards mentioned above, and credits for miscellaneous "standard" protective devices, installed according to certain "standard" requirements; also, there are a large and varied number of structural credits, the advantages of which are open to the owner chiefly at the time the building is erected.

For the average owner, a study of the inspection bureau's rate make-up or survey will yield little information which he can use or understand, as stated above, since most of the data on it is meaningless to the layman. He may find an after-charge for rubbish in the basement, have same removed and apply for a re-rating, only to have his rate increased owing to additional charges now in order which were not in order when his building was last rated; these new charges may more than offset the credit due to his house-cleaning efforts. In only rare instances can his insurance agent give him much assistance as to the application of rating schedules, because making rates is not an agent's function, and there is no particular incentive, and no "profit motive" at all, on the part of local or state agents or other insurance company representatives to spend much time trying to secure lower rates for him, because none of them will profit thereby, except to secure or hold his insurance. Furthermore, very few insurance companies or local insurance agencies find it desirable in the long run to maintain really efficient service departments or experienced rating experts; because, first, such service is expensive, even to the extent of not being profitable at all in many, perhaps most, cases, owing to the almost inherent desire and the practice of owners in smaller cities to distribute their insurance among all the agents in town regardless of service rendered, a practice which soon discourages all enterprising insurance companies and local agents; and, secondly, such service on the part of an insurance company or local agency immediately and logically creates combined opposition and competition, often bitter, on the part of all companies and agencies not able to furnish such service, with the result that those furnishing the service lose almost as much old business to combined desperate competitors as the new business gained through service, thus again making continuation of the service unprofitable.

This completes the vicious circle for the owner and brings him back to his original condition—a supplicant at the feet of the Rating Bureau organizations. This is not said, however, in criticism of either insurance companies or local agents, for all companies prefer low hazard risks and correctly written policies, and all local agents should want their assureds to have the lowest insurance rates possible. Nor is it said in criticism of the Rating Bureau organizations, for they are correctly and legally caring for the interests of their clients, the insurance companies. We are merely pointing out the difficulties of property owners in having their interests equally and properly cared for.

It may be added that, chiefly because of the above difficulties, it frequently is easier to quiet a dissatisfied owner by pointing out to him some impossible or excessively expensive improvement, such as correction of electric wiring or bricking-up some necessary door or window, than to try to satisfy him by real service. Such improvements as noted are manifestly out of the question, but as a result of their suggestion the owner gives up any hope he may have had for lower rates, and continues to pay as before.

The Fire Insurance Engineer Is the Solution of the Problem

The services of a capable insurance engineer, not connected with insurance companies or rating bureaus, but working only for his client, the owner, and on terms whereby his remuneration is contingent upon the savings he can produce, is the obvious solution to this owner's problem. Under no other conditions can he have competent assistance "on his side of the fence"; and this "fence" does exist because a fire insurance policy is only a contract between the two parties, the insurer and the insured; therefore there is a sharp and distinct division of interest which makes it incumbent on the insured owner to protect his own interests. This is only ordinary business prudence; it is no reflection on the integrity of the other party; furthermore, it is well to remember that the insurance company has capable insurance engineers protecting its interests through the work of the local inspection bureau.

The functions of the consulting insurance engineer may be grouped under four heads:

1. Reduction of rates through correct application of schedules and through elimination of hazards.
2. Accurate appraisal of buildings to ascertain and establish their present sound insurable values.
3. Setting-up correct policy forms, and checking-over existing policies to see that they are in order.
4. Checking-over plans for new buildings.

The first duty of the insurance engineer is to secure for his client the lowest possible published rates. To do this, his technical knowledge of rating schedules and their application must be on a par with that of the local inspection bureau engineers. He must be able to accurately rate his client's building under present existing conditions, then compare his findings with the inspection bureau's rate make-up to determine whether any reduction is in order or whether the rate is already too low; also to determine what physical corrections about the premises can be made at a cost

commensurate with the resultant premium saving. At all times he must be prepared to successfully defend his figures and his interpretation of the schedules; if he cannot do that, his services will be of little value.

Before asking his client to spend any money on improvements, the insurance engineer should analyze the present rate from start to finish, and establish the correctness or incorrectness of each individual charge and credit; also check up on charges or credits applicable but not now applied. Even arithmetical errors are sometimes found on make-up sheets; mistakes occur in any office, no matter how efficient and well organized. Such an analysis sometimes shows that a very considerable increase or decrease in rate is in order, based on present existing conditions, and it is only after determining the present correct rate that any attention should be given to possible improvements. Such a rate analysis will be very illuminating to the owner, and may show that items which he knew were being charged are really costing him but little, whereas other charges of which he knew nothing are responsible for the greater part of his premium cost.

High School Building and Contents	*Amounts of Insurance 3-Year 90% Blanket Form*
Gross Building Rate, .621	$348,436.20 Insurance
Gross Contents Rate, .901	$18,400.00 Insurance

Itemized Charges in Rate Make-up

	Rate		*Premium*	
	Building	*Contents*	*Building*	*Contents*
1. Basis	.2093	.2093	$729.27	$57.77
2. Area	.0042	.0042	13.63	1.16
3. Wood cupola	.0209	.0209	72.82	5.77
4. Precast concrete roof ...	.0209	.0209	72.82	5.77
5. Combustible partition, basement	.0209	.0209	72.82	5.77
6. Unprotected columns and girders	.1675	.1675	583.63	46.08
7. Domestic science	.0021	.0021	7.32	.59
8. Repair shop in basement	.1214	.1214	423.00	33.51
9. Open type motor	.0167	.0167	58.36	4.61
10. Occasional painting	.0167	.0167	58.36	4.61
11. Electric wiring	.0100	.0100	34.84	2.76
12. Stove pipe through partition	.0104	.0104	36.41	2.88
Published building rate	.6210	.6210		
Add contents differential ...		.2800		
Published contents rate		.901		
Total 3-year premiums			$2,164.28	$248.79

An Illuminating Instance

In the case of a large fireproof high school building where the rate seemed excessive, the school authorities had been told that charges for non-standard electric wiring and for a wood cupola above the main roof were responsible for a considerable portion of the excess in this rate. An analysis, however, of these items and their charges disclosed an entirely different situation. As the table herewith makes clear, the excessive cost was not due to wiring and wood cupola, but to non-standard fireproofing, also to a carpenter shop with non-standard motor and occasional painting; all in a small wing of the basement and subject to correction at reasonable expense as compared with the annual insurance charge.

In the case of extensive or valuable properties, the owner will find it advantageous to use the services of some well-established appraisal company in order to establish and keep up to date his appraised values. When that has not been done, the insurance engineer must be able to appraise buildings accurately in order to determine correct amounts of insurance; otherwise, he may leave his client with insufficient coverage to meet his co-insurance requirements, or may leave him with the property over-insured, which is an inexcusably wasteful situation. A study of the wording of policy forms will reveal the interesting fact that incorrect amounts of insurance may cause the owner great loss, but the possibility of loss to the company because of such incorrect amounts is remote. The owner needs correct appraisals to protect his own interests; the company is usually fully protected under its policy forms, whether the property is over- or under-insured.

At first sight, the setting-up of correct policy forms might seem to be an agent's function. Owing to the highly competitive conditions incident to selling fire insurance, many owners do not let one agent know what another may have written on his property; therefore, the insurance engineer often finds several different policy forms in effect, through no fault of the agents. In case of loss, this condition would greatly complicate the adjustment among companies on the risk; almost inevitably the owner rather than the companies would be the loser because of any such failure to have concurrent policy forms in effect.

When changes are made in rates, amounts of insurance, co-insurance clauses, or other features which involve corrections in premiums, the insurance engineer must also compute return premiums or any other premium adjustments. He must be able to check the published average or blanket rate when blanket coverage is desired. His service is not completed until he can show his client that the properties are correctly valued, adequately covered with insurance, and at the lowest possible premium cost, on policy forms which will stand the test in case of fire loss. His fee for this work must be on a basis which makes the transaction profitable to his client, the building owner.

THE EFFICIENT OPERATION OF A CENTRAL HEATING SYSTEM

BY BURDETTE R. SHELDON

Chief Engineer, Mount Holyoke College

THE central heating system installed at Mount Holyoke College has just completed its second year of operation. It is estimated that the investment of approximately $180,000 will be amortized out of savings in a period of eight years. The old heating system was without temperature control of any kind, and inefficient in its production and use of steam. The new plant is extremely flexible, owing to the multiplicity of units and the method of control, making possible great savings in operation.

The inspection and maintenance schedule in use at Mount Holyoke may be applied to any heating plant, and without doubt will show results in fuel saving and satisfactory operation.

The new plant comprises 120 oil furnaces located in the central plant, along with 50 furnaces which heat the off-campus buildings. These replace seven horizontal return tubular boilers which were hand-fired with bituminous coal, and twenty-seven cast iron boilers off campus, hand-fired with anthracite. Steam is delivered to underground distribution mains. The central plant supplies steam for 26 buildings having a total load of 154,500 square feet of radiation. The off-campus load covers 27 residences, with a total load of 38,000 square feet of radiation. Each of the off-campus buildings has its own heating plant consisting of from one to eleven furnaces, depending upon the size of the load supplied. No attendant is required in the latter buildings other than a service man who makes periodic inspection trips. The servicing of the 170 furnaces is attended to by this one service man.

The operation of the boiler plant is entirely automatic. A centralized electrically operated master control board governs the sequence of operation. The furnaces at the central plant are arranged in groups of five, and each group is automatically placed in service by pressure changes in the main steam header. The control is arranged to give sufficient lag after a change in pressure, so that furnace groups will not operate in answer to small temporary load fluctuations. A panel board carrying 144 pilot lights, arranged in groups of 6 lights each, indicates with the center light that a group of furnaces is called into service. Five lights about the center light indicate each individual furnace in the group as it comes into operation. A single toggle-switch on this board will shut down the entire plant. By this multiple group arrangement only enough furnaces to carry the load are used at one time. Consequently, yearly overall efficiency is high because of low standby losses.

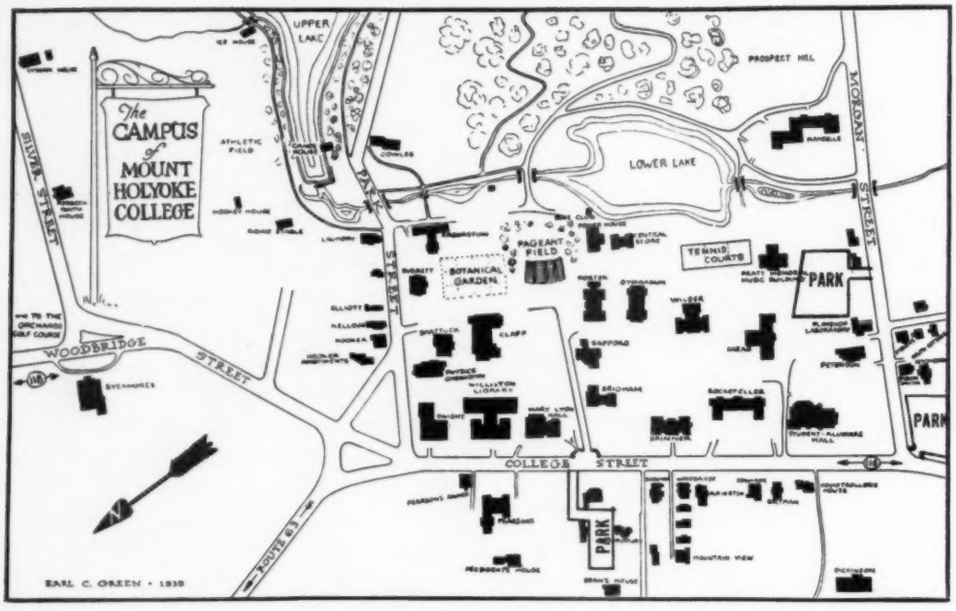
Connected with the control circuit are protective devices arranged to shut the furnaces down in the event of draft failure, low water, excess pressure, and flame failure.

Gravity returns from the buildings flow to a receiving tank at a low level. Uniform water level in the

Right—View Down One Aisle of Boiler Room

LEFT—THE NEW PLANT ADJOINS THE REAR OF THE OLD PLANT AND IS SO DESIGNED THAT AT ANY TIME THE OLD BUILDING MAY BE REMOVED, LEAVING AN INCONSPICUOUSLY HOUSED HEATING PLANT HARDLY VISIBLE FROM ANY POINT ON THE CAMPUS

The roof of the new plant is of concrete slab construction covered with 2 feet of loam and sodded over. The whole building, with its 30-foot campanile stack, blends nicely into the surrounding grounds



boilers is maintained by float-operated electric pumps which deliver the water to a water-level drum on the operating floor. This drum is connected to each group of boilers.

Combustion air is delivered to the plant by fans. Surplus air is removed by another group of fans. Some of this heated air is utilized in heating an adjoining service building.

Temperature in the campus buildings is maintained by means of a central outdoor thermostat at the plant. In response to outdoor temperature changes, the thermostat assumes definite positions. These positions permit other apparatus to actuate motor valves in the several buildings. The motor valves deliver steam in long or short cycles in accordance with outdoor temperature demands. Compensation for individual building requirements may be made by the operator. For example, one building may require more heat than another, owing to its location or construction. This result is obtained by delivering more or less steam to that particular building, independently of the thermostat setting.

Operating Procedures

In part, operating procedure at the plant consists of daily visual inspection of flames, monthly flue-gas analysis, and complete records of feed-water temperature, flue-gas temperature, oil consumption, and steam flow. Graphic charts record steam flow and pressure, feed-water temperature, and outdoor temperature.

A simple card index is used to record any work done on a furnace. Each group of furnaces has a number, and each furnace in the group a distinguishing letter; one card for each furnace.

A similar card index record is used for the various buildings. By reference to these records, any repetition of trouble or unusual performance can be seen. A very good indicator of faulty combustion is the appearance of the smokestack. Under normal conditions the exit gases are colorless. The appearance of visible smoke indicates poor combustion, and the faulty furnace is then isolated until the trouble is rectified. The monthly flue-gas check often discloses faults in air and fuel mixtures that would not be apparent in a visual inspection of flames. Likewise, a high stack temperature may indicate wrong air-fuel mixtures or dirty fire surfaces.

Temperature records are kept in the several buildings as a check on the operation of control apparatus. Thus, any overheating or underheating is apparent. These records are taken every two hours, and the cards are collected weekly. A study of the cards is a guide to making changes in heating schedules. Building occupants usually open windows when they feel uncomfortably warm, rather than closing off radiators. It is therefore important to keep room temperatures down to the point where it will be unnecessary to open windows. Individual requirements are taken care of by changing orifice sizes. Each radiator is orificed for equitable steam distribution.

In rooms which are troubled with underheating, leaky window frames and sash are a usual source of heat loss. Weather-stripping and frame-calking investments generally pay dividends in fuel saving. At least the effect upon the tenant's comfort is a tangible dividend.

Large savings in steam consumption can be made when it is possible to shut off steam entirely, as on holidays and other periods when the building will be

unoccupied. Where a large building has only a few occupants, it may be practical to install a separate steam line for the part which is occupied, thus permitting the major part of the building to be shut off.

In locations where indirect radiation is used with cold air intake, it is often feasible to partially or wholly recirculate the heated air, rather than heating a large volume of cold air to room temperature.

Water for domestic use is heated in each building by steam through conversion heaters. The tanks are equipped with temperature-control apparatus so that there will be no overheating. Tanks and steam supply lines are insulated against heat loss.

A periodic inspection of steam traps and other building apparatus prevents waste of steam by blowing traps or other equipment. Any failure to rectify a fault is disclosed by the records carried.

Cost records, compiled monthly, disclose wastes which might otherwise be overlooked.

During the summer the furnaces are cleaned. Particular attention is given to the fire side of flues and furnace sheets. Feed water is treated during operation, so that scale formation on the water side is prevented. All fan blades are cleaned periodically to prevent any drop in efficiency. All valves are packed in readiness for the coming heating season run.

FOR REFERENCE IN THE FIELD OF OPERATION AND MAINTENANCE

Helpful recommendations have been made in articles in previous editions of The American School and University: *

IN THE 1933-1934 EDITION

University and College Accounting and Reporting
By Lloyd Morey, Comptroller and Professor of Accountancy, University of Illinois

The Organization of a Department for the Maintenance and Operation of Public School Buildings
By George F. Womrath, Assistant Superintendent of Schools, in Charge of Business Affairs, Minneapolis, Minn.

Uniform Regulations for School Janitors
By T. C. Holy, Bureau of Educational Research, Ohio State University

School Warehouse Revolving Funds

Fire Insurance Protection and Costs for Public School Properties
By H. C. Roberts, Chairman, Committee on Insurance, National Association of Public School Business Officials

IN THE 1935 EDITION

Taking the School Inventory and Accounting for School Supplies in Small Schools
By F. E. Henzlik, University of Nebraska

Economy in Use of Janitor Supplies and Equipment
By H. H. Linn, Business Manager, Public Schools, Muskegon, Mich.

The Use of Color in the Remodeling and Renovating of School Buildings
By T. Merrill Prentice, Adams & Prentice, Architects, New York

The Modern Trend in School Construction
By Reginald E. Marsh, Tooker & Marsh, Architects, New York

Self-Inspection of Buildings for Fire Protection
By T. Alfred Fleming, Supervisor, Conservation Department, National Board of Fire Underwriters

IN THE 1936 EDITION

Effective and Efficient Operation and Maintenance of a School System
By Nate W. Downes, Chief Engineer and Superintendent of Buildings, School District of Kansas City, Mo.

Raising the Standards of School Sanitation
By George L. W. Schulz, Assistant Director, Department of Buildings and Grounds, Board of Education, Detroit, Mich.

The Summer Renovation Program
By J. L. Gleason, Clerk of School District No. 4, Livingston, Mont.

Maintenance and Operation of a University Plant
By Frederic B. Johnson, Yale University

What Price Neglect of the Heating Plant?
By Alfred Kellogg, Consulting Engineer, Boston, Mass.

See, also, the Classified Index in the rear of this volume for information concerning manufacturers of equipment or supplies. This list is necessarily abbreviated. However, additional information on any product—whether listed in the Classified Index or not—may be obtained by using the reply postcards bound in this section.

* Copies available at $2.50 each.

PORTER-CABLE MACHINE COMPANY

1819 N. Salina Street, Syracuse, N. Y.

REPRESENTATIVES IN PRINCIPAL CITIES

More than 2500 Schools are using Take-About Sanders

for refinishing desks, tables, cabinets, woodwork, slate blackboards, marble laboratory benches, etc.

Save $1.40 on Every Desk

The average cost of resurfacing desk tops with a Take-About Sander is ten cents. This includes labor, material, and machine depreciation. Compare this with the cost of resurfacing them by hand. Twelve to twenty desk tops can be resurfaced per hour without removing them from the classroom.

Let us give you an actual demonstration of the PORTER-CABLE TAKE-ABOUT SANDER.

. . . . . .

$.017 CENTS PER SQ. FOOT

That is the cost of resurfacing the floors in the Livingston, Mont., schools according to a letter recently received. This included labor, sandpaper, interest on investment and depreciation of machine. It repaid its full purchase price in a single vacation period of two months. Classrooms, halls, gymnasium, cafeteria and laboratory floors were resurfaced without hiring outside labor. Speedmatic Sander gives a lifetime of dependable and efficient service at lowest maintenance cost.

TAKE-ABOUT SANDERS SERVE DOUBLE PURPOSE

when not in use in the maintenance department. The Manual Arts department finds Take-Abouts ideal equipment for instruction in modern sanding methods. They raise the standard of work and turn out projects with an expert finish of which the whole school can be justly proud.

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SMOOTH FLOORS LESS CARE

Hundreds of schools are using Speedmatic Floor Sanders for renovating old, worn floors It is surprising how easily and quickly your own janitor or maintenance man can resurface floors at very little cost with a Speedmatic Floor Sander. No experience at all is necessary. The construction of these machines assures a fast, smooth, even job that saves floor maintenance materials and labor.

. . . . . .

SAWS THAT SAVE

Speedmatic Electric Hand Saws have many uses in your maintenance department. At least five times faster than hand sawing, they save time and do cross cutting, ripping, dadoing, grooving, beveling and many other operations, including cutting down slate blackboards.

These saws are adjustable for depth and beveling to 45°. Made in 6″, 8″ and 9″ sizes.

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PORTER - CABLE also builds a complete line of Disc, Spindle and Belt Sanders. 20″ Bend Saws, and other equipment for School Maintenance and Manual Training departments.

Write for a free copy of our School Equipment Catalog, without obligation.

MIDLAND CHEMICAL LABORATORIES, Inc.

Dubuque, Iowa, U. S. A.

MASTER FINISH

Midland Master Finish is a most remarkable product. It actually resists heat, alcohol, alkali, dilute acids and boiling water.

Master Finish contains a high percentage of Bakelite and Chinawood oil, which produces a tough, resilient, leather-like film that is the Master of wear, service, good looks and genuine satisfaction on wood floors, linoleum and woodwork.

GYMLOH

Midland Gymloh, like Master Finish, carries a high Bakelite content and is the outstanding finish for maintaining Gymnasium floors.

A treatment of Gymloh prevents wear from hard usage. It is guaranteed to be non-slippery, providing firm footing at all times. Gymloh is superior in every way to the various combinations of shellacs and varnishes so commonly used.

LOHSEAL

Midland Lohseal is a penetrating seal for use on new or resanded floors and as a coating for waxes. It seals the floor against penetration of moisture, dirt and grime. It resists stains, inks and oils.

Lohseal is approved by the National Maple Flooring Manufacturers Ass'n.

MID-CEDAR DUST LAYER

All waxed floors should be dry mopped daily with a cotton or linen strand mop, which has been previously treated with Midland Mid-Cedar Dust Layer, a non-sticky, cedar oil compound.

FLOOR ENAMEL

Midland Floor Enamel can be used on surfaces of wood, metal, cement, plaster, etc. This fine enamel embodies tough wearing, scrub-proof qualities and a surface with pleasing appearance, one that will take a wax treatment nicely.

It is obtainable in six colors: Tile Red, Slate, Pewter Gray, Meadow Green, Light Oak and Dark Oak.

FLOORMASTER

This 8 inch surfacing machine is easy to handle and operate. There are no chains, gears or belts to wear out or cause trouble.

The Midland Floormaster Sanding Machine is capable of producing a high quality finish at a rapid rate.

LACQAIRLUSTR

The finish made by lightly buffing in Lacqairlustr with cheesecloth, whether on wood, metal or leather surfaces, gives a perfectly clear film of protection. Its bright, gleaming lustre does not finger-mark or hold dust.

The real beauty of furniture and woodwork can be brought out with one easy application.

KRYSLOH

Midland Krysloh is excellent for general cleaning purposes and is of special value as a water softener.

It can be used for cleaning woodwork, washing windows, painted surfaces, dishwashing, laundry work, cleaning blackboards, etc. Krysloh dissolves in water rapidly and is very economical to use.

LOHZONE (BLOCKS) AND CRYSTALS

Midland Lohzone perfume blocks and crystals give quick deodorizing action and envelop the entire premises with a delicate, clean aroma that is lasting.

Both the blocks and crystals may be obtained in five different odors: rose, lavender, mint, cedar and narcissus. The Cedar blocks and crystals are excellent moth repellents.

FLUSHOLEUM

Midland Flusholeum (Liquid or Powder) has only one use, the cleaning of toilet bowls. It will keep them clean and sanitary.

Midland Flusholeum is not injurious to vitreous chinaware and will not remove the glossy surface of this material. Either the Liquid or Powder will give the same satisfactory results.

SHILOH

Here is a product that fills a very positive requirement in building maintenance. Shiloh properly cleans and at the same time polishes enamel, porcelain and like surfaces without injury.

It contains an extremely fine abrasive, a solvent for grease and oil accumulations and a chemical to remove the embedded soil.

BOILER COMPOUND

To those operating steam plants, Midland Boiler Compound is a necessity. This compound will keep the pipes, tubes, walls and shell free from insulating lime-magnesium scale.

Your boiler can be kept in condition to produce the maximum horse power in pounds of steam generated with Midland Boiler Compound. The maintenance and up-keep such as replacements of tubes, etc., is reduced to almost nothing.

MID-WAX

Midland Mid-Wax, a semi-liquid wax, combines all the qualities desired in a floor wax.

Wear	Non-Skid
Beauty	Non-Hazardous
Dustless	Hard to Mar

Scrub-Resistant

Midland Mid-Wax is a heavy basic product and therefore must be spread thin and evenly for best results. Because so little is required, Mid-Wax is exceedingly economical to use.

LOHBRITE WAX

Midland Lohbrite Liquid Wax has a Carnauba Wax and Resin base which imparts a lustre without rubbing or buffing.

This non-slippery wax may be used freely on such floors as wood, tile, marble, terrazzo, mastic, rubber, asphalt, cement, masonite, etc.

WAXLOH

Midland Waxloh is a modern wax finish for floors with an Asphalt Base.

It is applied with a lambs wool mop or clean cloth and buffs to a hard, transparent sheen which does not darken or discolor the surface to which it is applied.

TILEOLEUM

Midland Tileoleum, the perfect cleanser, has been found superior for cleaning Tile, Marble and Terrazzo. It is a penetrating cleanser that loosens and removes the dirt from these floors and restores them to their original beauty and brilliancy.

SCRUBBING MACHINE

This machine is modern in every way and built for service. Its simple, sturdy construction offers good work always, at a very low cost.

SCRUBBING COMPOUND

This pure vegetable oil preparation is in general use for an unlimited number of cleaning operations; due to the unusual cleaning strength of its ingredients, it is very economical to use.

FLOOR GLOH WAX

Midland Floor Gloh is a superior polishing wax for linoleums, wood, tile, marble and terrazzo floors. It is easily applied with a lambs wool mop, dries very rapidly and can be buffed to a beautiful finish with very little effort.

WE MANUFACTURE A COMPLETE LINE OF FLOOR FINISHES, WAXES AND CLEANSERS INSECTICIDES DISINFECTANTS LIQUIDS AND JELLY SOAPS.

THE HILLYARD CHEMICAL COMPANY

BRANCHES IN PRINCIPAL CITIES

St. Joseph
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SHINE-ALL SALES CO.
DISTRIBUTORS

A National Maintenance Organization . . . Thirty Years Continuous Service

"HILLYARD The Buy-Word of Maintenance Quality Since 1907"

Super SHINE-ALL Trade-Mark Reg. is not a soap, but a Neutral Liquid Chemical Cleaner for all types of floors, also painted and varnished surfaces. It possesses 100% active cleaning units. SUPER SHINE-ALL cleans, polishes, and preserves in one operation, requiring no rinsing. Saves time and labor. Officially endorsed by leading floor manufacturers.

HIL-BRITE Trade-Mark Reg. Self-Polishing Water Emulsion Wax, dries bright without rubbing or polishing, with a hard traffic resisting finish, yet has that soft lustrous glow of polished wax. It saves time and labor, cuts your waxing and cleaning costs in half. Endorsed by National floor manufacturers.

ONEX-SEAL Trade-Mark Reg. gives positive protection and restores the original attractive finish to Terrazzo, Tile and Cement. Tests proved ONEX-SEAL capable of withstanding the most severe weather and traffic conditions. ONEX-SEAL produces a waterproof, weatherproof, dust resistant, sealed polished surface. Nationally recommended by flooring contractors and manufacturers.

TERRAZZINE Trade-Mark Reg. excels for the premature curing of new Terrazzo. Approved by the National Terrazzo and Mosaic Ass'n., and selected by them to treat the Century of Progress display:—"The Cascades of the Months." Economical and simple to apply.

PINE-O-CIDE is an amber colored germicide, antiseptic and disinfectant made from pure Steam Double Distilled White Pine Oil, the highest grade possible to procure. It is soluble and forms a beautiful milk white solution in water. PINE-O-CIDE has a high phenol coefficient and serves efficiently as a fragrant antiseptic, nonirritating and non-corrosive. The fragrant pine odor makes PINE-O-CIDE a very effective deodorant for use in public buildings and institutions.

HIL-GLO FINISH Trade-Mark Reg. is especially designed to serve on Class Room and Gymnasium floors. Universally used for the reclamation and preservation of wood floors in all types of buildings. HIL-GLO FINISH is supreme for wearing quality, is non-skid and does not easily rubber burn.

DIAMOND FINISH Trade-Mark Reg. produces a brilliant, long wearing surface, easy to apply with brush or mop. Quick drying and especially adapted for wood floors.

PENETRATING SEAL NO. 21. The purpose of Penetrating Seal is to SEAL the fibre against penetration of moisture, thus reducing warping, to seal against penetration of dirt, ink stains and moisture, to preserve the natural color of the floor, and provide a more permanent finish that is both beautiful and economical, to reduce maintenance costs.

Penetrating Seal No. 21 fills and seals wood floors, thus eliminating penetration of grease, stains and dirt. All spots and blemishes should be removed prior to application of Penetrating Seal No. 21 either with a strong cleaning compound or by sanding, otherwise they cannot be removed.

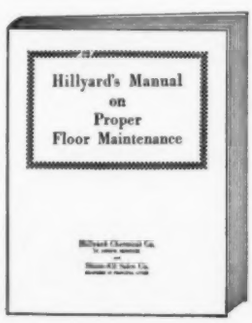
HIL-TONE. Hil-Tone removes rubber burns and other marks from wood floors. It not only removes the marks easily when properly used, but also seals and protects the wood itself. The wood retains its light color and does not become oily or greasy as when ordinary dressings are used.

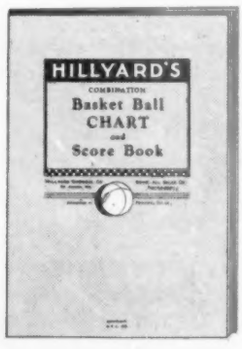
AUTOMATIC SWEEPING BRUSH leaves a clean lustrous surface, absorbs the dust, saves labor. The wicks are detachable and washable.

Sizes 12, 18, 36 inches

WINDO-CLEAN. This lightning cleaner dissolves grime and removes dirt. No effort. No mess. No hard work. Eliminates buckets, sponges, water, squeegees and chamois, and makes glass sparkle.

FREE — THREE VALUABLE BOOKS — These three books full of valuable information, just off the press and compiled by the Hillyard Chemical Co. at considerable expense, are for you . . . absolutely FREE. Just another proof that the Hillyard Chemical Co. are the leaders in the field of Sanitation and Modern Floor Maintenance.





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Hillyard's Super SHINE-ALL used daily on Cincinnati Union Terminal Floor

SUPER-SPECIAL GYM FINISH produces a non-slippery, durable and sanitary floor, easy to maintain. Withstands hard and constant wear, gives proper reflection of light eliminating eye strain, insures a perfect non-slippery surface which will not rubber burn. Nationally used by leading Schools, Universities and Athletic Clubs, Private and Public Institutions.

HILLYARD'S WOOD PRIMER definitely seals and preserves, insures an ideal surface for the application of any desired finish or treatment. Universally used for the reclamation and preservation of wood floors in all types of buildings.

RENOVATOR. Hopelessly black and gummy floors can be brought out to look like new with Hillyard's Renovator. Oil-soaked wood floors can be scrubbed and bleached to a light color. The extra power in Renovator makes the toughest job easy.

HAND SOAP. Velva-San is shipped in concentrated form, insuring the customer of 100 per cent value in every gallon. Although usually shipped and prepared in its natural state, Velva-San may be had in various colors and perfumes. Velva-San provides individual hygiene used in our dispensers. It is a forward step toward eliminating sickness and disease spread by unsanitary bar soap.

VICTOR SOAP DISPENSER. Built substantially, can always be depended upon to operate perfectly. Made of genuine brass parts, chromium plated. No springs to get out of adjustment, its use insures against waste of soap through dripping. Has universal ball-bearing valve. In case of breakage, any one of the three separate and distinct parts can be replaced at one-third the cost of a new Victor.

HILTONIAN "8" Floor Sanding Machine. With its ease of operation and handling, the Hiltonian "8" stands alone in the field of high production sanders. Although light in weight, nothing is sacrificed in cutting efficiency, as the 1 H. P. Heavy Duty Motor, 8-inch Sanding Drum travels at a surface speed of 3,534 feet per minute.

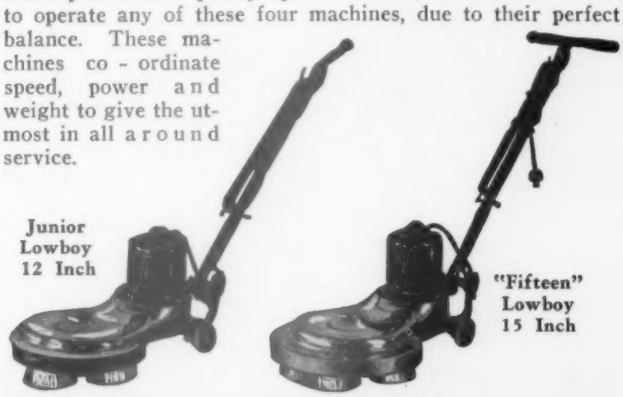
The Drum is dynamically balanced and with the "Hiltonian" improved spiral wrap of sandpaper, the quality of work cannot be surpassed.

Speed combined with light weight has long been desired by Educational, Public and Private Institutions.

HI-KO. Hi-Ko, a sodium hypochlorite solution, has an extremely high phenol coefficient. A couple of ounces to large quantities of water kills germs. Athlete's Foot—a disease caused by the germ (tinea trichophyton), invades every locker and shower room. Hi-Ko kills this germ. Use it to free infected floors.

Adding 12 ounces of HI-KO to the water in the tray will prevent "Athlete's Foot." The tray should be placed so that each person must walk through the solution when entering or leaving the pool or showers.

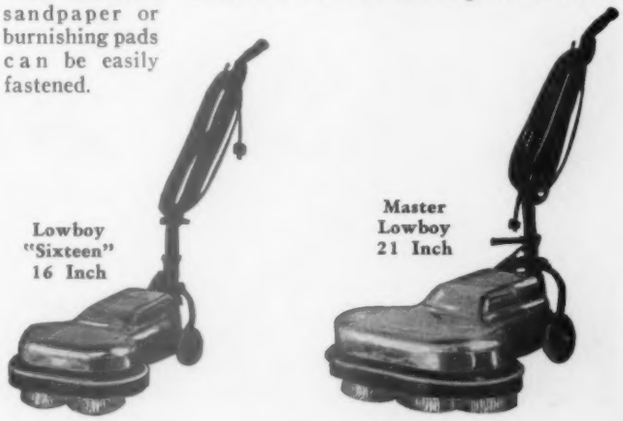
HILTONIAN Scrubbing and Waxing Machines. Hiltonian Electric Scrubbing and Waxing Machines are sturdily built and quietly operated. It takes but little effort to operate any of these four machines, due to their perfect balance. These machines co-ordinate speed, power and weight to give the utmost in all around service.



Junior Lowboy 12 Inch

"Fifteen" Lowboy 15 Inch

A BRUSH FOR EVERY NEED. Brushes that are available include Bassine, Tampico, Palmetto, Fibre, Steel Wool and Wire. There are also attachment plates to which sandpaper or burnishing pads can be easily fastened.



Lowboy "Sixteen" 16 Inch

Master Lowboy 21 Inch

J. I. HOLCOMB MFG. COMPANY

Indianapolis, Indiana

New York San Francisco

CLEANING MATERIALS . . . "BUILT FOR THE JOB"

The J. I. Holcomb Mfg. Company was founded 41 years ago (1896) and in less than a quarter of a century it became the leader in its field—the manufacture and distribution of cleaning brushes and cleaning chemicals. It both attained and has maintained this leadership through intensive training of its salesmen to sell "the correct tool for the job."

Generous, open-hearted truthfulness carries with it a conviction of honesty and makes a permanent friend of the buyer, who realizes the seller is at all times endeavoring to sell that merchandise which will warrant the buyer's continued patronage.

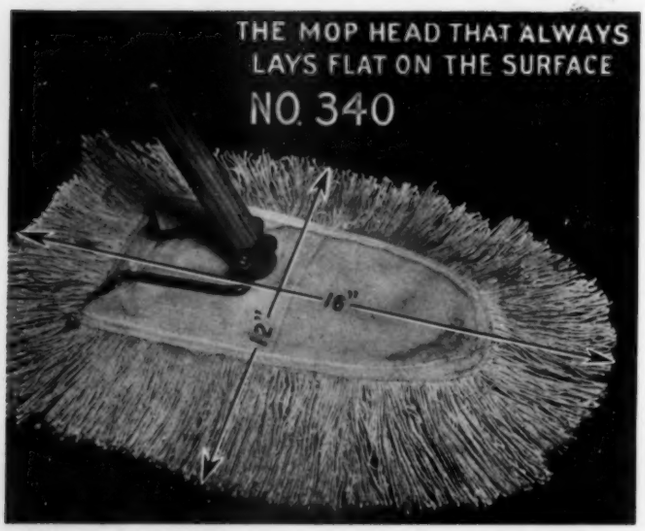
We ask for your continued patronage and all those affiliated with this organization will endeavor to warrant it.

Reduce YOUR 95% Labor Cost with Holcomb "Built for the Job" Cleaning Tools.

VITALIZED CLEANER

Cut cleaning time by using a liquid compound that penetrates and **floats off** the dirt, grease and soil WITHOUT LABORIOUS SCRUBBING. Vitalized Cleaner removes dirt and grime from Floors, Walls, Woodwork, Linoleum, all painted surfaces and Furniture without harm to any surface that a good neutral soap and water will not harm. It is not a soap, but a compound developed on Holcomb's new, scientific principle of removing grease and grime **quickly** without back-breaking scrubbing. Vitalized Cleaner speeds up the job but works **thoroughly.** Its time and labor savings, over other materials, more than pays for its cost.

In 55-30-15-5 gallon drums.



HOLCOMB'S 340 MOP

In a school the cleanliness of the ceilings, walls and transoms is as important as the cleanliness of its floors. For this purpose the **340 Mop** is one of Holcomb's greatest labor and time savers. Shaped to the corners, its long handle makes the high spots on ceilings, transoms, leaded windows and casings easy to reach and SPEEDY to do. THOUSANDS of soft spun cotton strands form the mop head. IT WILL NOT SCRATCH. The heavy fabric pocket-in-head slips easily on self-adjusting metal frame. The mop lies flat on the surface at any angle of the handle and the substantial frame permits extra pressure on floor polishing with safety. Removable head is washable by hand, washing machine or laundry—Retreated with NU-FINISH makes it like new.

No. 340 Mop—12″ x 16″ spread. Handle included. No. 341 Mop Head Only.

NU-FINISH—in 1-5-15-30 and 55 gallon containers.

J. I. HOLCOMB MFG. COMPANY

Indianapolis, Indiana

New York San Francisco

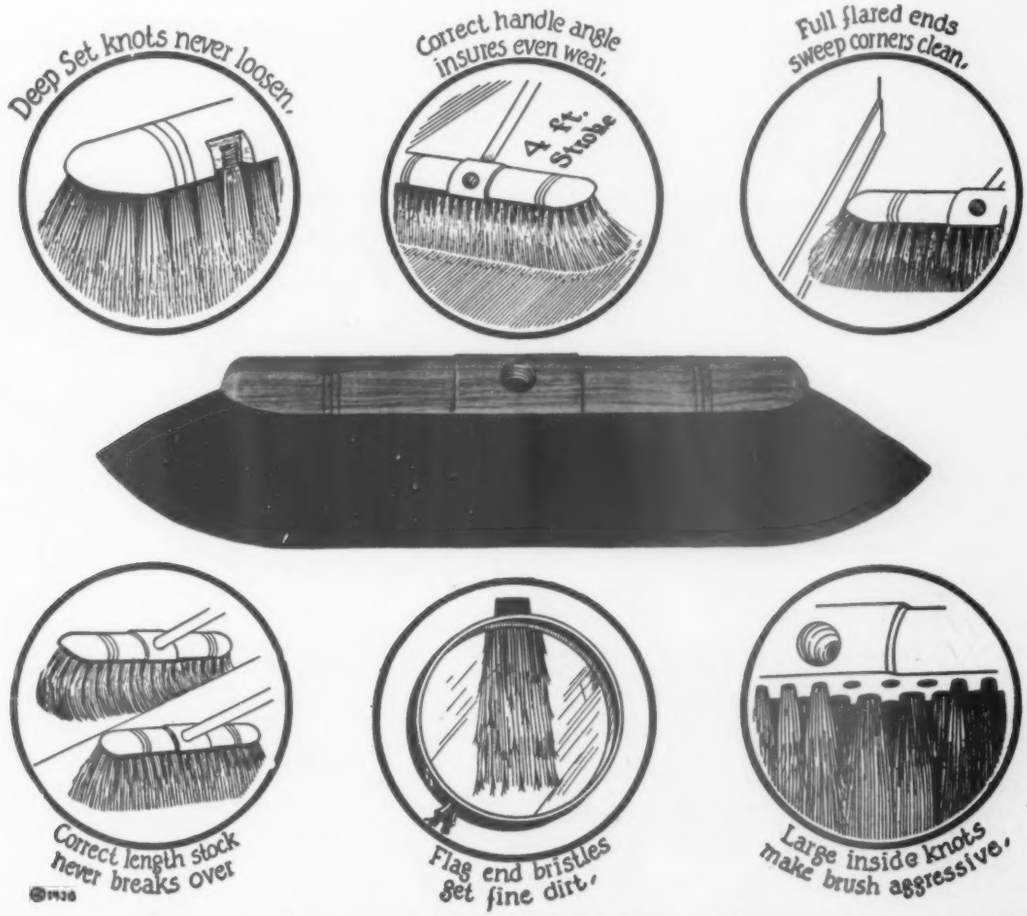
CUTTING SCHOOL CLEANING COSTS

There is a reason why nearly **70 per cent of the schools of the country** are using Holcomb Cleaning Tools and Chemicals. For years the J. I. Holcomb Mfg. Company has been solving the unusual as well as the usual cleaning problems of the nation. Their Floor Brushes, Dusters, Scrubs, Toilet Brushes, Cleansers, Deodorants, Disinfectants, Floor Finishes, Waxes, Polishes, Liquid Soaps and special tools are the standard by which other tools and chemicals are judged. There is an especially designed tool . . . a particular cleaning chemical or brush for every cleaning job in your school . . . built to do the job thoroughly and to cut LABOR Costs by cutting LABOR Time.

CLEANING DOLLARS ARE DIVIDED!

Out of every Dollar you spend for Cleaning only 5 cents is for the Material!

If you save 10% on the materials you save but little. . . . If you save; with Holcomb tools, 10% of the LABOR COST your yearly profit is materially increased. If you spend $50.00 for materials and $950.00 for labor . . . WHICH will it pay you to save 10% on? **CUT down the LABOR COST with tools built by Holcomb.** If you speed up the job only 1 hour each day, with a Holcomb tool, that is a new yearly PROFIT of about $100.00 to your institution.


Deep Set knots never loosen.
Correct handle angle insures even wear.
4 ft. Stroke
Full flared ends sweep corners clean.
Correct length stock never breaks over
Flag end bristles get fine dirt.
Large inside knots make brush aggressive.

Correct Construction Cuts Cleaning Cost!

Every Minute Counts
When It's Sweeping Time

LET US HELP YOU SOLVE YOUR CLEANING PROBLEMS

THE AMERICAN SCHOOL AND UNIVERSITY

THE AMERICAN CRAYON COMPANY

Manufacturers of a Quality Line of Floor Finishes

Sandusky, Ohio

BRANCH OFFICES

New York, N. Y., 200 Fifth Avenue — Dallas, Tex., Santa Fe Building — San Francisco, Calif., 116 New Montgomery St.

• KAYSAN—THE PERFECT FINISH FOR EVERY HARD-SERVICE CONDITION

KAYSAN is manufactured by the makers of the first penetrating varnish developed for heavy-duty, hard-service floors. It is recommended without reservation for schools, stores, factories, offices, clubs, public buildings, apartment houses and similar types of buildings where floors receive excessive wear but must be attractive and in keeping with their surroundings.

quickly enough so second application can be put on about two hours after the first. In the case of a third application, this third application can also be put on about two hours after the second.

It is a very durable finish which does not water spot, crackle, or scale off, gather dirt like oil, scratch or mar, need wet scrubbing, nor increase the fire hazard.

It applies easily, seals the wood, prevents slipping, gives a lustrous finish and **takes hard wear.**

KAYSAN Has All These Remarkable Qualities

Brings out the full beauty of the grain to a remarkable degree.

Needs never be refinished, but can be repolished with one application of KAYSAN as often as wear requires.

Will not show laps but can be applied to traffic lanes without resanding and refinishing the entire floor.

Dries bone dry and may be polished by friction.

Withstands the hardest usage.

Easily cleaned—reduces maintenance to a minimum.

Reduces time and labor to minimum as it sets up

KAYSAN allows the wood to more nearly retain its natural wood appearance than any other finish.

Cost of Application

Its ease of application and minimum cost of maintenance, makes cost of finishing with KAYSAN very economical.

Covering Capacity

Under average conditions, 1 gallon of KAYSAN finishes on oak, approximately 300 square feet with three applications; on maple, 400 square feet with two applications.

OTHER OLD FAITHFUL FINISHES

• FILTITE—An excellent sealer for old cement and similar surfaces.

• KAY-WAX—(liquid) and • KAY-WAX Paste—Floor waxes.

• TRAZATITE—A Terrazzo sealer and finish.

• OLD FAITHFUL PRODUCTS

Backed by 102 Years of Successful, Expert Manufacturing Experience

1835–1937

OLD FAITHFUL

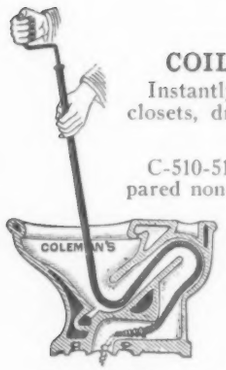
Also Crayons, Water Colors, Pencils, Inks, Pastes, and other Old Faithful Products

• Reg. U. S. Pat. Off.

ALLAN J. COLEMAN

Manufacturers of Sewer, Pipe, Closet and Drain Cleaning Tools

120 W. Illinois St., Chicago, Ill.



Flexible Closet Cleaners

COIL WIRE CLOSET CLEANER

Instantly removes obstructions from water closets, drain pipes, etc.

Grade A

C-510-515. Flexible Coil made of a special prepared non-corrosive **Swedish Spring Steel Music Wire** No. 12 gauge, ½" size, with removable corkscrew and cone wire.

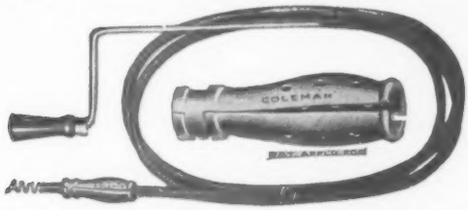
C-510—3-ft. Music Steel Wire Spring **$4.50**
C-515—6-ft. Music Steel Wire Spring **5.50**

Grade B

Made of good oil-tempered steel, 12-gauge wire ½-in. size.

C-516—3-ft. coil, black enameled... **$3.50**
C-517—6-ft. coil, black enameled... **4.50**

FLEXIBLE COIL WIRE SEWER AND PIPE AUGERS WITH AUTOMATIC GRIP HANDLE



For use in removing obstructions in vacuum, drain pipes or sewers. Made of the best oil-tempered spring steel, and are flexible, enabling them to turn bends and go through traps. Made with cork-screw and handle complete, also furnished with automatic grip handle.

Style No.	Size, Ins.	6-Ft. Lgth.	9-Ft. Lgth.	15-Ft. Lgth.	25-Ft. Lgth.	50-Ft. Lgth.	100-Ft. Lgth.
C-520a	3/16"		$1.25		$2.25	$3.80	$6.80
C-520b	¼"		1.55		2.70	4.25	7.65
C-520	⅜"	$2.00	2.70	$4.50	6.75	10.20	17.00
C-525	½"	2.25	2.90	4.95	7.20	12.75	21.25
C-528	⅝"			5.85	8.10	13.60	25.50

		Price
C-530—¾",	10-ft. sec., hdl. and corkscrew	$5.50
	Extra 10-foot section	5.00
C-535—1",	10-ft. sec., hdl. and corkscrew	6.50
	Extra 10-foot section	6.00

Nos. 530 and 535 are furnished with handles and corkscrews and all connections. Made in 10-foot sections.

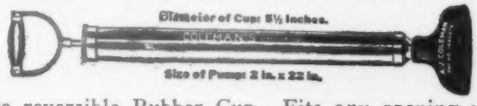
For cleaning out straight sewers or drains. Made of a special oil-tempered, flat spring, steel wire. Equipped with spear point, roller ball and grip handles, which increases efficiency. Use either end.

Style No.	Size, Ins.	25-Ft. Length, Each	50-Ft. Length, Each	*75-Ft. Length, Each	*100-Ft. Length, Each
C-532	⅛ x .030	$1.25	$1.75	$2.50	$3.50
C-534	5/16 x .030	1.50	2.50	3.50	4.50
C-536	¼ x 1/16	1.85	3.50	5.00	7.00
C-537	½ x 1/16	2.40	4.50	6.00	8.00
C-538	¾ x 1/16	4.00	6.00	8.00	10.00
C-539	¾ x ⅛	6.00	8.40	12.00	16.00
C-539a	1 x ⅛	7.00	10.20	13.80	18.90
C-540	1¼ x ⅛	7.20	10.80	14.40	20.00
C-542	1½ x ⅛	8.40	12.00	18.00	24.00

* Furnished with Frame. Other lengths, 75 cents extra.

Catalogues Sent on Request

BRASS SUCTION AND FORCE PUMP

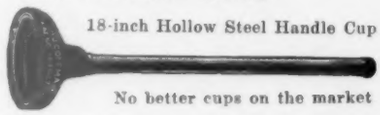


Large reversible Rubber Cup. Fits any opening up to 5 inches. Wonderful article for opening sinks and drains.

C-500—Pump with Cup. Weight, 6 lbs. ..... Each **$12.00**
C-505—Cup only. Weight, 1 lb. ..... Each **1.50**
C-508—Graphite packing rings ..... Per set **1.50**

SUCTION AND FORCE CUPS

High grade rubber. All handles secured to Cup by threads and sockets.



Style No.	Size, Ins.	Color	Wood Handles, Ins.	Price Per Doz.
C-545	5½	Red	Steel 18	$24.00
C-550	5½	Red	Cup Only	18.00
C-555	5½	Red	Wood 30	15.00
C-560	5½	Black	Wood 30	12.00
C-565	4½	Red	Wood 30	9.00
C-570	4½	Black	Wood 30	7.80

*DOUBLE SUCTION AND FORCE PUMP

*No. C-600. This pump is made especially for pumping out hydrants and closets, to keep them from freezing, or can be used for pumping water out of drains, boats or any opening where water collects.

Also can be reversed and used as a Force Pump to force light stoppages and clogs through pipes, sink traps or drains of any kind. An especially good bilge pump for pumping out boats, as you can pump many gallons of water per minute.

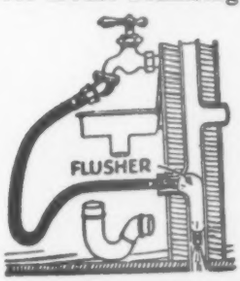
Frozen hydrants and closets cause trouble and expense which is easily avoided by using this strong, durable and efficient DOUBLE-ACTING PUMP.

Stroke 18", 2" cylinder seamless drawn brass tube. Inlet valve furnished with 8 ft. of good hose and outlet valve 3 ft. of hose. Weight 10 lbs.

*No. C-600—Price—Pump complete with hose **$18.00**

HYDRAULIC FLUSHER

House Faucet Connection. Standard Size of Flusher for House Plumbing That Gives Results.



This Sewer Flusher is made of several plies of water-tight heavy rubberized fabric which makes it Strong, Durable and Flexible, easy to insert into traps, vents, curved sewer drains or pipes. A very efficient article when it is necessary to wash out pipes or sewers. When connected with strong water pressure, flusher is expanded to size of drain, thereby giving a direct water pressure close to stoppage. Sizes to fit all pipes.

Size of Pipe Sewer and Flusher	Standard Coupling	Price
No. 1—1½" Sink Flusher	¾"	$2.50
No. 2—Sink 2" Catch Basin	¾"	2.75
No. 3—3" Pipe Flusher	¾"	3.00
No. 4—Pipe, 4" or Toilet	¾"	4.25
No. 5—Heavy 4" Sewer	¾"	4.75
No. 6—Pipe, 6"	¾"	7.00
No. 7—Sewer, 6" Extra Heavy Flusher	¾"	7.50

GENERAL FLOORCRAFT, INC.

333 Sixth Ave., New York City

The Low Cost Quality Line

GENERAL FLOOR MACHINES

A SIZE TO SUIT EVERY NEED AND BUDGET

GENERAL SINGLE-BRUSH "QUIET" FLOOR MACHINE

HEAVY DUTY **ALL GEAR DRIVE**

Illustrated Below

Power—speed—quiet—low cost: these are the most important factors to be considered in the purchase of a floor machine for any school building. The complete line of **General** floor machines offers all these factors, in both single-brush and two-brush models, for all types of work and sizes of budgets.

The **General** Single-Brush Floor Machine illustrated below has achieved widespread popularity, due to:

1. the complete continuous dependability of floor maintenance service
2. unsurpassed quality of construction
3. low cost

This "Quiet" model, heavy-duty, with all gear drive, provides efficient every-day long-hour duty for hundreds of schools, and is exceptionally quiet and easy to operate.

All our models have all of the weight concentrated directly over the brush area for maximum efficiency in performance of floor maintenance work; and all are powered by motors of exceptionally rugged design and with unusually quick starting torque.

Made in three sizes—13", 15" and 18" brush diameter

Made in three sizes—14", 18" and 22" brush spread

GENERAL TWIN-BRUSH "NOISELESS" FLOOR MACHINE (Above)

The **General** Twin-Brush Models were designed and developed to meet a very specific need—permanent quietness of operation, in schools and institutions where quiet is essential. These twin-brush models have no gears, no chains, no grease. They are driven by a series of heavy-duty multi-V belts and carry a permanent guarantee against noisy operation. They are even quieter in operation than the Single-Brush "Quiet" model, without sacrificing any mechanical engineering qualities that have made this "Quiet" model the choice of so many schools in the past. **Guaranteed Permanently Noiseless.**

FREE TRIAL OFFER

The many advantages of the **General** line of floor machines may be seen on your own school floors. You can try a **General** before you buy one. Our representative will call to demonstrate, or, if you prefer, a ten-day FREE trial of any model can be arranged—without obligation to buy.

All models of General floor machines will

WAX — POLISH — SCRUB — DRY CLEAN — REFINISH, ALL TYPES FLOORS

INVINCIBLE VACUUM CLEANER MFG. CO.

5000 Davis St., Dover, Ohio

The Highest Standard of Cleanliness at Low Cost

Invincible Heavy Duty Vacuum Cleaners, with many advanced and exclusive features, are setting the highest standard of cleanliness in schools, colleges, universities, and buildings everywhere. Cleaning and maintenance costs have been reduced, and thereafter kept at a minimum.

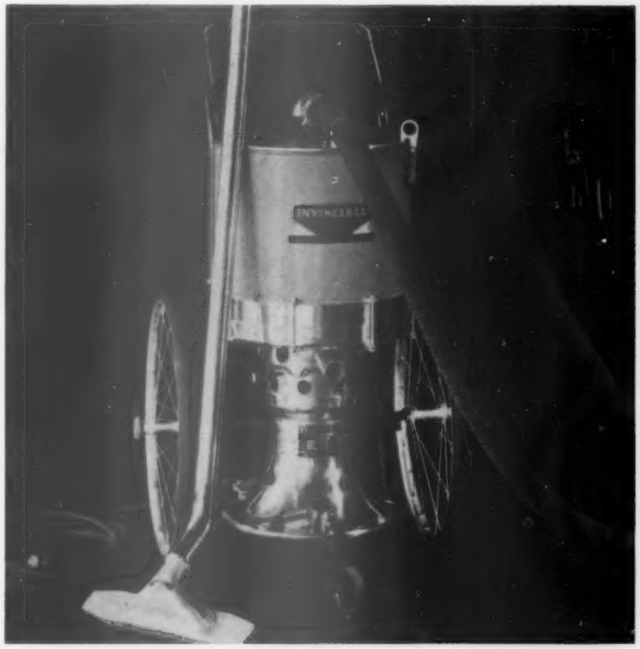
There is no limit to the usefulness of INVINCIBLES. They clean rugs, any kind of bare floor, furniture, equipment, basements, boiler-rooms, and every conceivable surface from floor to ceiling.

Designed from start to finish as portable machines, INVINCIBLES are light in weight, easy to use, speedy, and can be wheeled effortlessly and quickly to any part of a building. Yet, they are ruggedly constructed of the best materials to withstand years and years of constant, hard usage.

Tremendous cleaning power means the speedy removal of every particle of dust, dirt and litter. Even the pores and cracks of flooring are freed from damaging, disfiguring dust. Unlike other methods, no dust is stirred up, and dust accumulation is prevented.

THE INVINCIBLE ALL-SERVICE

The models shown are but two of the complete Invincible Line of ten. There is an Invincible Model that will properly meet any cleaning requirement . . . small or large.



THE INVINCIBLE UNIVERSAL PORTABLE

The Invincible Universal Portable is compact, light in weight, and designed for quick, thorough cleaning. Its sturdy, rugged construction, with no overhanging parts, no stress, no strain, is approved by engineers throughout the world.

Mounted on its large, swivel-wheeled carriage, it is extremely portable. It follows the operator by a slight pull on the hose, and can be easily wheeled up and down stairs. There are no exposed, inflated bags. All dust and dirt is securely held in one large, metal-enclosed container which can be removed, emptied and replaced in less than one-half minute. All separation takes place before the air reaches the vacuum producer. Hence, there is no wear or tear on the mechanical parts.

Motor—¾ hp.	Height—37 in. over-all
Suction—42 in. water	Width—23 in.
Volume—135 cu. ft. per min.	Weight—70 lbs.

The Invincible All-Service

This model is smaller and lighter in weight than the "Universal Portable," yet it embodies all the superior Invincible Features. It is easily carried by the handle, and is a remarkably efficient heavy-duty cleaner at a surprisingly low cost.

Motor—½ hp.	Height—19 in.
Suction—30 in. water	Width—12 in.
Volume—120 cu. ft. per min.	Weight—42 lbs.

A wide assortment of correctly designed tools is offered . . . tools for general cleaning, or special cleaning problems.

We shall be glad to give complete information, recommendation and quotation, on request. There is no obligation.

Established 1898

LINCOLN-SCHLUETER FLOOR-MACHINERY COMPANY, INC.

Phone: Superior {8944 / 8945

Manufacturers

213-221 W. Grand Avenue, Chicago, Ill.

Whether the floor space to be scrubbed, sanded or polished is measured in square feet or acres, there is a Lincoln Machine of the most advanced design and correct size for economical maintenance.

Since these machines are already standard equipment in many of the largest schools and institutions throughout the country, they need but little introduction.

Forty years of successful floor machine manufacturing is built into every Lincoln. Every product in the Lincoln-Schlueter line is correctly designed and ruggedly built.

THE MULTI-PURPOSE FLOOR MACHINE
SANDS—SURFACES—STEEL WOOLS—BUFFS—POLISHES

In small classrooms, or large gymnasiums, assembly halls, school cafeterias—regardless of the size of the floor space—the new 3-in-One Lincoln-Schlueter Multi-Purpose is the perfect machine for sanding, cleaning, steel-wooling or polishing.

As its name implies, the Multi-Purpose Machine is adaptable to a variety of uses—all necessary to the proper preparation and care of wood floors.

The small illustration below shows a Multi-Purpose steel wooling off the black dirty accumulation found on a classroom floor that has been excessively oiled

SPECIFICATIONS

Motor—1 H.P. ball bearing—constant speed.

Drum—9" wide—speed 1000 R.P.M.

Dust Collector—Ball bearing—highly efficient.

Weight—125 lbs.

Drive—"V" belt—positive smooth and silent.

Equipment—50 ft. extension cable—dust bag—sand paper—steel wool—polishing brush, wrenches, etc.

LINCOLN TWIN-DISC TYPE NO. 16

This model is recommended for smaller schools for cleaning, scrubbing or polishing. It has two 8-inch diameter brushes covering a floor span of sixteen inches, yet the machine is so compact that it may be used in congested areas or in primary grade rooms with complete satisfaction.

Handle may be set to allow the machine to pass under low furniture, desks, etc.

Average capacity of the Type No. 16 is from 1500 to 2000 square feet per hour.

LINCOLN TWIN-DISC TYPE NO. 20

This type is recommended for the larger grade school, and especially for scrubbing and polishing floors in assembly halls, corridors, gymnasiums, etc.

This model has two 10½ inch diameter brushes which cover a total floor span of 21 inches overall. The machine is powered by a ½ H.P. heavy-duty ball-bearing motor. A 5-gallon water tank with lever control for water feed, as illustrated, is optional equipment.

Average capacity of the Type No. 20 is from 2500 to 3500 square feet per hour.

There are 12 models of Lincoln Floor Machines—one of which will fit your requirements exactly

WRITE TODAY FOR COMPLETE DESCRIPTIVE CATALOG AND DETAILS OF FREE TRIAL OFFER

THE SPENCER TURBINE COMPANY

Hartford, Connecticut

THE SPENCER CENTRAL VACUUM CLEANING SYSTEM

The Spencer Central Vacuum Cleaning System has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Spencer Central Vacuum Cleaning is a permanently installed system for the speedy and complete removal of dirt and dust from all kinds of floors, walls, ceilings, furniture and other building equipment. It consists of five essential parts, each carefully selected to meet the special requirements for each individual building:

Central System

1. A vacuum producer, located in the basement. 2. Inlet valves, conveniently located on all floors and piped to vacuum producer. 3. Specially designed, entirely enclosed, and easily cleaned separator. 4. Light weight, flexible hose. 5. Special vacuum tools for each operator.

Spencer Vacuum Producers—The Spencer Vacuum Producer is of the turbine type but differs from most turbine exhausters in that it is designed and built especially for vacuum cleaning.

The impellers are made of the best sheet steel or duralumin; carefully balanced and tested. They are so proportioned that they will not clog or wear out and are mounted in the turbine casing with extra wide clearances on both sides. The use of several impellers in series makes it possible to obtain any desired volume and vacuum with low peripheral speeds.

Separators—The principle of centrifugal separation is standard on Spencer Systems. It has been found from actual tests that centrifugal separators will separate from 95% to 98% of the dust which is picked up by the cleaning tool.

Tools — Spencer tools are designed with openings in correct proportion to the rest of the system; also with special consideration as to convenience and fitness of the various requirements. Strong in construction, light in weight, and shaped for fast and effective work. Tools are equipped with Spencer universal controllable swivel, which enables operator to remove dirt beyond the reach of the rigid tool. All wearing surfaces are renewable. Tools are attached to handle by means of a convenient locking chuck.

Advantages—In exhaustive tests in leading schools, the powerful vacuum, scientifically applied with correct tools, has demonstrated its ability to remove more of the dirt in less time than other methods.

Because the equipment is simple in design, requiring little attention and because these systems are built to provide satisfactory service over long terms of years, both the operating and amortisation costs are extremely low.

One janitor can clean twelve average sized class rooms in two hours with a 3 Hp. Spencer System. The Spencer elbow joint makes cleaning around furniture easy.

For Cleaning Erasers and Chalk Trays—The Spencer Central System, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of eraser or chalk tray.

Cleans the Boiler Room—This system cleans boiler room floors—removes dust and soot from pipes and draws soot out of the boiler tubes, often saving the whole cost of operation in this one item alone.

Swimming Pool Cleaning Equipment—By means of special cleaning tools usually employed in connection with the pump on the filtering system it is possible to remove accumulated sediment from swimming pools without the waste of water involved in draining the pool. Bulletin on request.

Booklet—A number of Spencer-cleaned schools are illustrated in our booklet, sent on request.

Heavy Duty Portables—A new light weight portable vacuum cleaner using the same type of vacuum producer and the same tools is available at low cost for small public and private schools. Demonstrations available on request. Write for the pamphlet.

SPENCER PORTABLES

G. H. TENNANT COMPANY

Established 1870

GENERAL OFFICE AND FACTORY

Minneapolis, Minn.

EASTERN SALES OFFICE: Westfield, N. J.

THE TENNANT FLOOR MAINTENANCE SYSTEM

The Tennant Floor Maintenance System offers a scientifically correct procedure for the treatment of new wood floors and for the re-conditioning, cleaning, maintaining and re-finishing of old floors.

During the short time this modern process has been on the market it has been adopted as the standard floor maintenance method by school systems in all parts of the country, by the United States Government and by leading industrial firms.

The Tennant System is entirely different from any other floor maintenance process.

Further information, with illustrated circular, will be sent on request. One of our trained floor experts will gladly demonstrate the Tennant System for you, and tell you of floors in your own locality maintained by Tennant Dry Cleaning.

THE TENNANT FLOOR MACHINE—MODEL C

Dustless Dry Cleaning . . . Dustless Sanding Polishes . . . Waxes . . . Seals and Burnishes . . . Scrubs

Demonstration of Tennant System of Floor Maintenance at Convention of National Association of Public School Business Officials

VESTAL CHEMICAL LABORATORIES, INC.

St. Louis
4963 Manchester Avenue

New York
2413 Third Avenue

PYRA-SEAL

A Heavy Duty Surface Seal

for Maple, Beech, Birch, Oak and Pine floors. Seals the pores against the penetration of dirt—resists oil and ink stains as well as moisture—prevents decay. Dries with a high lustre yet non-slippery to foot traffic. Outwears ordinary finishes many times.

VESCO-SEAL

A Heavy Duty Penetrating Seal

for Maple, Beech, Birch and Pine floors. Vesco-Seal penetrates deep down into the fibers of the wood, dries hard and has sufficient body to tie the surface fibers into an integral whole. Resists soil stains and moisture—will not mar or craze and presents a non-slippery elastic finish particularly desirable for gymnasiums.

VESTA-GLOSS

The Self-Leveling, Self-Polishing Water-Proof Wax

—a finishing coat, easily and quickly applied which requires no polishing to produce a tough wear resistant finish with all the beauty of a waxed surface. Floors treated with Vesta-Gloss are easily maintained and eliminate the need of frequent mopping. Traffic lanes may be rewaxed without showing laps.

APPROVED

Vestal Floor Products are approved by leading school architects, the Maple Flooring Mfrs. Assn., National Oak Flooring Mfrs. Assn., and manufacturers of all types of resilient and composition floors.

BRITEN-ALL

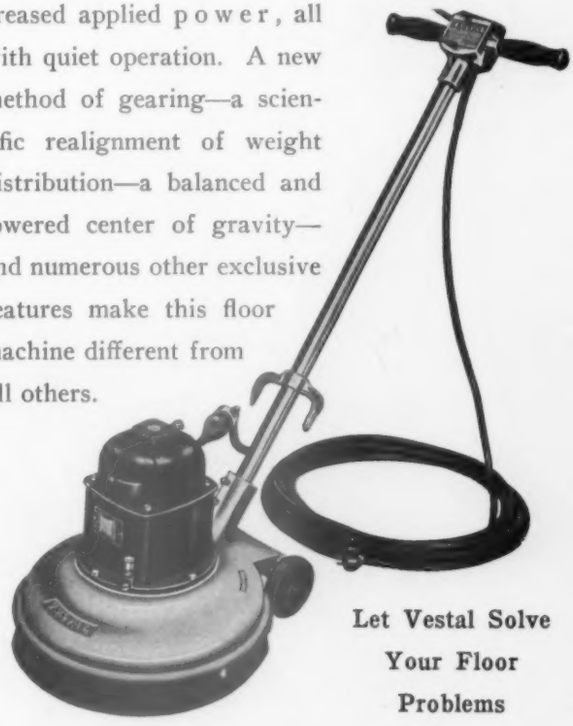
"The Protective Cleaner"

Cleans hard-to-clean surfaces with speed and ease because it dissolves completely in warm water forming a solution that loosens dirt by fast, **safe,** chemical action. Dirt, grime and grease are thus picked up in the scrub water and easily mopped away. No alkali or abrasive to injure the surface. Leaves floors clean and sanitary—brightens and preserves the original colors and finish of every type of flooring material.

VESTAL FLOOR MACHINE

Scrubs, Waxes, Polishes

The Vestal Floor Machine presents a new and radically different design which is responsible for its amazing ease of handling and its tremendously increased applied p o w e r, all with quiet operation. A new method of gearing—a scientific realignment of weight distribution—a balanced and lowered center of gravity—and numerous other exclusive features make this floor machine different from all others.



Let Vestal Solve Your Floor Problems

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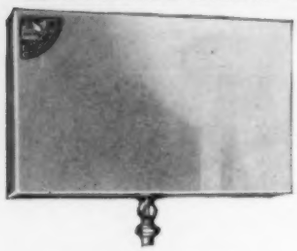
BRANCHES IN PRINCIPAL CITIES

SOAPARATUS LIQUID SOAP DISPENSING SYSTEMS—LATHERATOR LIQUID SOAP DISPENSERS

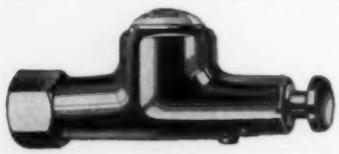


Soaparatus Tanks

Soaparatus Tanks are made of vitreous china, vitreous enamel on welded sheet iron or white enamel on rustproof sheet metal, and are designed to cover a minimum amount of wall space. They are made in approximately one, two, three or five-gallon sizes. If it is desired, the entire system, including nickel-plated piping, unions, shutoffs and all parts can be made at our factory to be shipped complete and assembled for exposed installation.

TANKS

No.	Fluid Content, Gal.	Height, In.	Width, In.	Depth, In.
Vitreous China Soaparatus Tanks				
1	1	8 5/8	10	4 3/8
2	1 3/8	9 1/4	12 3/4	4 1/4
3	2 1/8	9 3/4	15 3/4	4 1/2
5	3 1/8	12 3/4	16 1/4	5 1/2
Monel Metal Tanks				
2	2	12	13	3 1/8
3	3	12	15	3 7/8
5	5	15	16	5 1/2
Metal Tin Tanks				
1	1	8 1/2	9 1/8	3 3/4
2	1 3/4	9 3/4	12	3 7/8
3	2 1/2	10 1/2	15	3 7/8
5	4 1/4	12	15 3/4	5 1/4
10	10	18	22	6



Soaparatus Valve

Mechanically efficient and designed to harmonize with the finest plumbing fixtures. The patented air chamber, within the dome on the upper side of the valve, starts a gravity discharge when the plunger is pushed. The supply from the main reservoir is shut off automatically as the plunger is operated and a predetermined correct amount of soap flows gently into the hand without splashing or squirting.

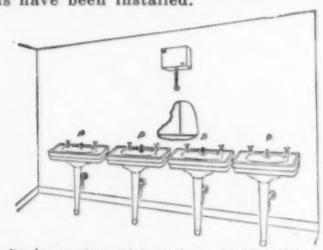
The inlet of the Soaparatus Valve is made of tool steel gauged within .00025 in. and the plunger which fits into this inlet is made of selected drill rod. These parts fit so accurately that they can withstand the pressure of more than 150 lbs., without causing the valve to leak. This careful gauging in every part of the valve makes the assembled product as nearly mechanically perfect as possible.

The Soaparatus Valve has been adapted also to a basin fixture, being a simple adaptation of the standard valve to meet this condition.

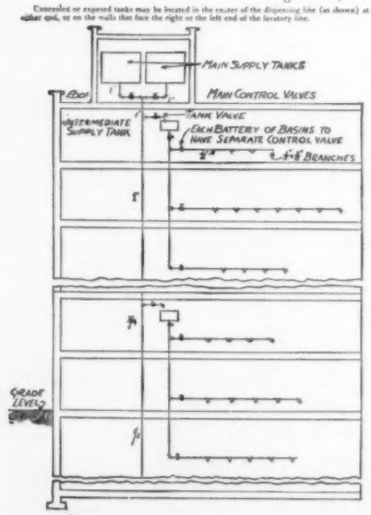
The Soaparatus Valves are finished in nickel or chromium to conform with the other fixtures.

Scope of West Service

West Disinfecting Company has a national reputation for the quality of its products. The experience of this company in installing soap dispensing systems in buildings of every type offers architects, builders and owners a service that will prove of exceptional value. Being the country's leading makers of liquid soap, service organizations are maintained in the larger cities, thus insuring every co-operation after dispensing systems have been installed.



Concealed or exposed tanks may be located in the center of the dispensing line (as shown) at either end, or on the walls that face the right or the left end of the lavatory line.



Preferred layout, using double supply tank and relay tanks to reduce pressure.

Engineering Service

We maintain an Engineering Department Service for consultation with architects and engineers or owners of buildings.

Individual Soap Dispensers

Individual soap dispensers also furnished.

Pullman Type Latherator Can be Filled Without Removing Globe

No. 1 Tilting No Strain on Wall

No. 50 Push In Globes Replaceable

Installation

The Soaparatus system, due to its flexibility, is admirably adapted to varying conditions of installation. One tank may be used to supply any number of valves, and extensions may be made as required, provided they are at a level at least a foot lower than the location of the supply tank in order to provide proper gravity flow. When installed in connection with new construction, where provision has been made in the plans or where existing conditions will permit, the piping from the tank to taps may be concealed, creating an exceptionally neat appearance. In cases where it is impossible to conceal the piping a thoroughly attractive installation is provided by the use of nickel-plated piping throughout.

Latherator Dispenser

The West Latherator introduces a brand new principle in liquid soap dispensing. Ordinary soap dispensers merely dispense liquid soap and leave it to the user to work up a lather. But the Latherator automatically agitates the soap into a rich, creamy lather before it leaves the outlet. Users say that no other type of soap dispenser makes washing so pleasurable as the Latherator.

The West Latherator offers a real economy in operation over other liquid soap dispensers. Less soap solution is used by a person washing with the Latherator than by one trying to work up a lather with the ordinary dispenser. None of the soap runs off the hands unused. Careful tests made by purchasing departments of large users show that a gallon of soap will wash from 40% to 50% more hands when dispensed through a Latherator than when used through other types of dispensers. The saving over a period will cut the owner's soap costs in half.

The lather making is all done in the Latherator valve. This can be attached to any liquid soap supply line, without any change, except the removal of the old valves and the substitution of the new Latherators. In addition to supply line outlets, Latherators are made in two other models:

The Pullman, which attaches to the washbowl.

The Self-contained Unit, which is attached to the wall over the washbowl.

Latherators are finished in either nickel or chromium to conform with the other fixtures.

SECTION IV
LANDSCAPE DESIGN AND DEVELOPMENT

PRINCIPLES OF EFFECTIVE PLANTING OF SCHOOL GROUNDS

BY HARLOW OLIN WHITTEMORE

Department of Landscape Design,
University of Michigan

THE planting of trees, shrubs, flowers and grass on school grounds is only a minor part of the whole job of school-grounds development. It is in many cases the most conspicuous part, however, and the average person naturally, but mistakenly, assumes that landscape design consists only in arranging plant materials in decorative fashion.

A reading of the article and the thoroughly studied outline by Harold S. Bates and A. Carl Stelling in the 1936 edition of the American School and University entitled, "Landscape Development of the School Site," will quickly correct any such impression. This shows that landscape architecture aims to make physical provision for all the human needs and activities that may be expected on a given area, and to do so with the greatest economy of time, space and money, and to secure the greatest efficiency in purposeful activity. The good designer also insists that all this be accompanied by an agreeable, satisfying appearance of the school grounds as well as of the building. Good appearance helps to develop happy associations, pride of ownership and loyalty, and contributes much to the esprit de corps of the school student body and the teaching staff.

School-ground planting, therefore, while it cannot take the place of good proportion, balance, and continuity in the arrangement of the open spaces and use areas, may be used to assist in these necessary things, to delimit the areas and effect a happy transition from one unit to another. Too much has been heard of the sentimental notion of a tree or a flower for its own sake, of beauty as its own excuse for being. Sentimental Arbor Day tree planting should give way to sensible tree planting where a tree is used to improve the appearance of the building and the grounds as a whole, in cooperation with other trees and objects; in short, as part of the landscape master plan. A good rule is that whatever or wherever we plant, there should be three good reasons for doing so. The preparation of the general or master plan is therefore the first requirement of a good school planting.

Practical and Esthetic Uses of Plant Materials

Following is a list of purposes which plant material can be made to serve on school grounds:

Shade on the street, walks, edges of play areas, and on the ground outside the school windows in late spring and early fall.

Screening out undesirable objects outside the school grounds.

A windbreak for grounds which are in the open country. This will make the playgrounds more comfortable and reduce the fuel bill for heating the building, lessening draftiness within. (A winter wind, moving at 20 miles an hour, against an unprotected building, will triple the amount of fuel required to heat the building.)

A snow-fence to prevent deep snow-drifting on drives and walks in the northern states and in the mountains.

A frame and a *background setting* for the school building.

Filtering the view of the building if it is of plain and simple architecture, thereby effecting a saving in building costs. It is here seen through open branches and foliage without being hidden.

A transition from the building to the ground by foundation planting of a restrained type.

A separation between adjacent open areas, in the form of a hedge or hedgerow. This last use is possible only with the protection of the plants from dashing children, which is almost impossible on active play areas.

A ground cover for soil erosion control on sloping grounds.

To hold the banks along streams or on pond shores.

To keep the water cool in lakes, streams or wading pools.

On the front grounds to *retire the building* from the busy street and make it appear to stand farther back than it actually does.

To reduce the noise coming from street traffic or from nearby railways or factories. Plants of fine texture but dense foliage, such as spruces, cedars and hemlocks, barberries, five-leaved Aralias, English privet and spiraea, are good to use for this purpose. A grassy or rose-covered high terrace bank is also good.

To unify the appearance of the grounds by focusing the attention along the major view axes.

To lightly shade the lawn and help prevent burning-out in hot, dry summers. Elms and honey locusts are excellent for this purpose. It is also interesting to note that certain trees of the legume family, such as honey locust, black locust, yellowwood, coffee tree and red bud, actually seem to improve the growth of grass below them. This is possibly due to the stimulation of nitrogen-fixing bacteria by leguminous plants. Heavy-shading trees like sugar maples, Norway maples and horse chestnuts are apt to kill the grass by over-shading and sapping moisture from the soil.

As grass to form a *velvety green carpet* over approach areas or other spaces which can be protected from playing children. Kindergarten areas, if large enough, can be kept in grass if the grass is tough and well fed.

As flowers *for children's gardens* and exhibition areas for classes in gardening and botany, including wildflower gardens.

As specimen trees and shrubs for a small arboretum in some retired corner. All the plant materials on the grounds can serve for study purposes for identification and growth and care of plant materials.

As a woodlot, if the school is so fortunate as to have 10 acres to spare for it. An existing woodlot is best, but one can be planted by students and maintained by them for study purposes; thus children learn the behavior of trees under semi-forest conditions.

In a small orchard or fruit garden for the study of pomology or small fruit culture.

To enframe and *provide a setting* for distant views outside; the making of artistic compositions out of these outside views or of informal parts of the school grounds not needed for active play. A bit of advice given by Frederick Law Olmsted many years ago holds good here: "Plant the corners and the boundaries, and the rest will take care of itself."

Thus we have a considerable list of uses, both practical and esthetic, that may be served by plant materials, all contributing to the comfort, convenience, educational value and appearance of the school grounds. Now for some of the difficulties.

The Selection of Trees

There are no difficulties found in planting on school grounds that are not found somewhere else, but I think I can say feelingly that nowhere else are they all found in one spot. One of the first questions comes from the fact that most schools are set in open fields entirely innocent of trees, or on hills where nearly all the existing trees are destroyed in fitting the ground to the building. The big question is: shall we plant fast-growing, but short-lived and temporary trees, in order to make a quick showing, or shall we plant slower-growing but permanent and long-lived trees? My answer is, "Both." By clever planning, and watchful maintenance and action at the right times, it is possible to get a quick effect with temporary trees, and to have the permanent trees coming along at the same time, the temporary trees being removed before they become decrepit or seriously injure the permanent trees.

A short list of quick-growing temporary trees is as follows: cottonwood poplar, Lombardy, Bolleana and Simon poplars; white, royal, Russian golden and bronze barked willows; Wisconsin and Salamon weeping willows; Siberian elm, silver maple, Russian olive, box elder, Ailanthus, or Tree of Heaven; canoe birch, gray birch, green ash, etc. In the western section of the United States between the Pacific slope and the Missouri River these are depended upon for permanent planting because of the difficulty of growing anything else. I have purposely omitted the black locust, because it is usually riddled with borers.

The more permanent trees that can be worked in through these by proper selection, association and placing are as follows: white pine, Scotch pine, Douglas fir, hemlock, white spruce, white fir, American elm, Scotch elm, sugar maple, red maple, honey (not black) locust, European and littleleaf and silver lindens, tulip tree, red, bur and pin oaks, Norway maple, London plane, coffee tree, yellowwood tree, and many others.

Certain cautions of course must be observed. Poplars and willows should not be planted near sewer outlets. Fast-growing trees of heavy shade or vigorous roots should not overshadow permanent trees which are sensitive to shade or root competition. Of course we will assume that all trees are to be planted in soil in which they will grow happily, whether it is naturally or artificially prepared. For example, if the soil is very sandy, one would start out with Lombardy and Bolleana poplar, silver poplar, Siberian elm, Russian olive, and canoe and gray birch, followed by white and

Above—Fig. 1. Play Meadows, Football Field and Running Track. A Rare Type of Setting

Left—Fig. 2. A Grove of Native Oaks Preserved in West Portion of Grounds. No Play Allowed Here

Fig. 4. Well Framed by Trees from This Side (West), This Building Needs More Trees on the East for Frame or Background. The Terrace Parapet Is Somewhat Bare; It Needs Some Open Type Shrubbery Like Cotoneaster

Fig. 3. Free Play Area Near Elementary School Building. A Delightful Rural Setting Created by Meadows, Creek and Native Trees

Fig. 5. Softball Diamond in a Play Meadow. Native Trees Preserved. Note Steep Bluff Protected Against Erosion and Children by Dense Tree and Shrub Growth

Scotch pines, Douglas fir, white fir, red cedar, red oaks, scarlet oaks, tupelo, yellowwood, etc.

Most shrubs and climbers develop rather rapidly, and they can be planted in place immediately. The exceptions are the evergreen shrubs, which are best not combined with the more vigorous, deciduous shrubs. In their case close planting with subsequent thinning is preferred.

In Relation to the School Building

One of the chief problems on school grounds is the large scale of the school building. The usual methods of planting about small houses do not apply at all. Massing of evergreens and shrubs at corners and entrances usually is in too small a scale, or else it shuts out the light from important ground-floor windows.

The best method of procedure is to plant fine shade trees off the corners or well out in front of the building, if it is long, so placed as to divide the façade into comprehensible sections. These trees will serve to frame and filter the façade of the building. Rounded masses of upright-growing shrubs, such as lilacs, may be placed at the corners for transition to the ground. Evergreens are apt to become too thin if of the arborvitae-cedar type, on account of the violent winds at corners, or because of partial shade near the entrances. Vigorous evergreens may get too large in time. Vines, well selected, say, Engelmann ivy at the corners and Japanese ivy on the wall spaces between, will help very much a building of plain and simple type. Where ground-floor windows are continuous at the ground, it is often possible to bring the shrub planting forward about 20 feet in front of a light court. This is better for the light in rooms, and for the growth of the shrubs, and is just as effective as seen from the street or entrance walk.

The Care of the Planting

Another problem is that of year-around care of the planting. The janitors are usually expected to look after the grounds as well as the building. They are so busy with the building that practically no attention can be given in spring and fall. In the summer they will deservedly like to ease up somewhat. Thus the spring work and fall work are neglected, the summer is too hot to work outside, and, beside, "the landscape architect should have specified plants that can take care of themselves"!

The answer is that the school system should have a qualified man or group of men whose business it is to keep up the grounds. Failing that, an interested member of the teaching staff of each school could be made responsible for the direction of some garden workers who are employed during the season, and could be given an honorarium of a few hundred a year to study over and solve the maintenance problems. The landscape architect should be retained annually to advise in the maintenance and development of the areas.

The Lawn

The making and the maintenance of a good lawn could be the subject of a special lengthy article or booklet. The reason that so many lawns look thin, yellow, weedy and dry in spite of much watering is the lack of a proper deep, rich soil preparation in the first place, the wrong kind of seed mixture, or the lack of subsequent feeding. Lawn soil should be slightly acid, for slightly alkaline soils encourage dandelions and other weeds. Dandelion roots are used by ants for winter forage for their "cattle," which are plant lice. The ants pasture the lice on shrubs in the summer. So by improper soil preparation we may have the triple disaster of dandelions, ant hills and plant lice.

As a matter of fact, a well-fed slightly acid lawn will crowd out almost any weed that grows. The simplest way to acidify the lawn soil is the liberal use of ammonium sulphate as the nitrogen-bearing element in the complete fertilizer. The ammonia breaks away and feeds the grass, while the sulphate remains as acid which slowly combines with other soil elements, or leaches away.

Keeping up the appearance of the front lawns is the chief worry of the average janitor in summer, because it makes the biggest difference in appearance, so he concentrates on the grass. Most of the time is spent in watering and cutting. A great deal of time in watering and much water can be saved by proper fertilization of the lawn. A well-fed lawn uses less water to keep up its appearance. It must be well fed in making, and kept fed about every two months during the growing season. This cannot be done in summer only.

Many people have installed automatic sprinkling devices for watering. It is true that this insures a green lawn at all times with little attention if kept in working order, but a careful calculation should be made to determine whether interest and depreciation on the cost of installing an automatic sprinkling system is higher than the wages of a workman to do the same work if he is persistent and intelligent. The man who sprinkles a lawn by holding a hose in his hand should be discharged at once, for he knows nothing, cares nothing, and will never learn anything. One man can keep two dozen sprinklers going at once if he is lively and smart. I expect to hear from this that all these men are out selling automobiles or insurance, but there are, I am sure, a few left in each town.

Planting versus Play Space

The largest problem to be faced in school-ground planting is the wear and tear of playing children. One

Fig. 6. Left—Four Years After Planting. Small Stock Used. Right—Twelve Years After Development (1936). Shade Trees Need Trimming Up. Flagpole Is Too Large and Too Tall

Fig. 8. South End of Small Children's Playground and the Border Planting (1936, Twelve Years After Development)

Fig. 7. Garden Court at Rear (West Side)—A Study or Social Area. A Fine Place for a Flower Display

Fig. 9. Left—Main Entrance—A Wide, Beautifully Proportioned Entrance Walk Set Off by Hedges and Low Evergreen Planting

Right—Street Facade and Auto Entrance—Even a Beautiful Building Is Helped by the Framing and Filtering of Trees and Their Branches

Fig. 10. Running Track and West Edge of Play Meadows and Football Field. Even the Power Plant Looks Well Fitted into the Hillside and Filtered by Trees

stray football with a small boy after it can wreck completely a young shrub or evergreen. Thus, no such plants should be used on play areas. Larger trees can be planted, however, protected with guards and staked closely. Vines can be planted on walls, fences and banks above retaining-walls. We have used native sumacs and Lombardy poplars on terrace banks about school grounds, which have grown fairly well in spite of the terrific attack. Vines on the school walls should have small guards over the base, especially at first.

Trees are to be used only around the edges of play areas large enough to provide ample play space. If not, bring in the fences just enough to allow for a tree-planting space outside the fence but on the school property. In fact, this method is now usually recommended for the fences on all playgrounds. The fence is set back, say, 20 feet from the sidewalk, and the space is used for trees, shrubs and grass to keep up the general appearance of the street and school site. A playground is thus clear of obstruction and most efficient, yet has shade about the edge.

Overcoming Soil Erosion

On hilly sites, soil erosion is a large problem. Terrace banks on playgrounds are so overrun that no grass can grow, and gullying occurs immediately. In the front yard these banks can be planted to grass, which is hard to mow, of course. So, dense ground-cover planting is resorted to. On north slopes use creeping myrtle, Japanese honeysuckle, Indian currant, Swiss mountain currant, spreading yew, etc. On south slopes use fragrant sumac, smooth sumac, Wichurian roses of many varieties, false indigo, Caragana or Siberian peatree, trailing juniper, Japanese juniper, mountain juniper, and Mugho pines.

On the playground all this is futile unless fences are used to protect the materials, or the bank rests on high retaining-walls. The bank is wasted space as far as play is concerned, and the designer should calculate the value of the play space and balance it against the cost of retaining-walls with protective fences on top. On one example we were able, by spending $4,000 for retaining-walls, to create play space which would have cost $12,000 to purchase near by. If there is no money for walls, a tough plant like the aforementioned sumac and poplar combination might be tried; if that fails, the only alternative is to pave the bank with cobblestone and issue strict orders that the cobbles are not to be used for "duck on the rock."

Cultivating and Watering

Last summer was one of the driest on record in the Middle West. Trees and shrubs, no matter how well established, suffered greatly and are much weakened. The first year after planting should see that constant water is provided the new plantings. A thorough watering is necessary with a pailful to each tree once or twice a week in dry weather (once each two weeks in wet weather) poured into a basin made about each tree and allowed to soak, not run, away. After the water soaks away, rake dry dirt over the wet mud as a mulch. The tree is thus cultivated and watered at the same time.

Older trees and shrubs and vines also need attention in dry summers. The easiest way to take care of them is to sink 2-foot sections of 4-inch drain tiles vertically in the ground at 3-foot intervals, the tops just below the grass level. Fill these holes each time the grass is watered. The tree will respond most gratefully to the real soaking of the soil down where the roots are. The tree can be fed by fertilizer solutions through these same tiles. Or it can be fed by punching holes with a crowbar every 3 feet under the spreading top, and a handful of chemical fertilizer dropped into each hole. Tree feeding will make watering go farther also.

To Save Existing Trees

Where a school site can be obtained with a generous supply of existing mature trees, the board can consider itself fortunate. When one considers the trouble and time and expense and patience required to produce a full-grown tree of good quality, he will realize that such trees where they exist are very valuable indeed. It behooves the designer to so plan the building or to so lay out the grounds that as many of these as possible can be saved.

One cannot fill or cut away the ground about older trees without killing or weakening the trees, unless energetic measures are taken to prevent permanent injury. The ground levels should be left as they were. Where filling must be done, a radiating nest of drain tiles should be laid on the ground leading from an opening about the tree, so that the roots are aerated through these tiles. Merely leaving a depression about the trunk will serve no particular purpose. If the ground is cut away about the tree, leave it standing on a mound in which watering tiles are placed. If a foundation wall calls for cutting the roots away on one side, this should be done skillfully so the roots will heal over. Backfill against the wall with rich soil, and feed and prune the rest of the tree to balance loss of roots. This will leave nothing to chance.

Grove? Or Playground?

A grove of trees on a school ground has several valuable uses. It may serve as an informal play space for kindergarteners if large enough. It may be a community picnic ground. It may be a study area for tree and bird life. This grove must not be used for a general school playground, because the tramping and packing of the soil will injure and possibly kill the

trees. The grove is so valuable that the purchase of additional open space for playground is thoroughly justified.

A balancing of the value of the trees and the grove should be made against the price of the additional land before deciding to use it as playground. How much are trees worth in cash? It is safe to say that healthy, well-established trees of over 3 inches diameter are worth at least $10 per inch of trunk diameter. In many cases they are worth much more, in that they are irreplaceable in less than forty to eighty years.

The Cost of Planting

On the whole, the cost of planting on school grounds is so variable that one cannot state it in terms of percentages of the total. In preparing a budget for grounds development, if the board allows 10 per cent of the cost of the building for developing the whole of the grounds, which is a reasonable figure, it is probable that 3 per cent of that amount should be set aside for the planting unless the grounds are quite level and also well drained, or, conversely, very steep and costly to develop with terraces, etc. Please remember that the cost of planting must include soil preparation, under-drainage, purchase of trees, etc., shipping, planting, pruning, watering and staking. Intensive care and cultivation the first year should also be included, as part of the first cost, not added to the maintenance budget, for neglect is sure to result.

To sum up, let us say that school-ground planting should be made a part of the carefully coordinated general landscape plan of the grounds and not left to chance planting, chance financing, and the whims of individuals or groups with great enthusiasm but insufficient guidance.

AUTHOR'S NOTE.—The photographs illustrating this article were taken at the following schools:
Flint High School, Flint, Mich., Figs. 1, 2, 3, 4, 5, and 10.
Tappan Junior High School, Ann Arbor, Mich. (H. O. Whittemore, Landscape Architect), Figs. 6 and 8.
Jackson High School, Jackson, Mich. (Pitkin and Mott, Rochester, N. Y., Landscape Architects), Figs. 7 and 9.

SCHOOL YARDS ECONOMICALLY SURFACED AT BLOOMINGTON, ILLINOIS

BY FRED CARLTON
Superintendent of School Buildings and Grounds

IN 1935 four different grade-school yards in Bloomington were surfaced. The jobs were awarded to a local contractor, who mixed emulsified asphalt, sand and crushed limestone at a central mixing plant and hauled the material to the job. The surface was spread with this mixture, rolled with an 8-ton roller and then given two seal coats to prevent moisture from penetrating. A light scattering of sand was placed over the seal coats.

We consider it quite an advantage to have a central mixing plant in our town, because we feel we get a better mixture and the work is carried on more rapidly, which means the elimination of a lot of construction joints in the work.

This year we have constructed another playground, and we hope eventually to cover all the public school playgrounds with this sort of surface, because we find that the playground can be used in wet weather as well as dry and that the children are less apt to fall and injure themselves. We feel that surfacing of this character is ideal for the purpose.

In our climate, however, it is necessary to place a 4-inch-thick layer of the mixture and to watch the surface for any indications of cracks. This is very important because of the danger of moisture getting into the cracks and freezing, which as a rule causes a great deal of damage. In one or two instances we have repaired cracks by sealing them with emulsified asphalt. This is a very simple operation and takes but a short time.

Franklin School Yard—Paved in 1935

Courtesy of The Texas Company

Tooker & Marsh—Holden & McLoughlin, New York City, Associate Architects

The Quogue School, Southampton, L. I.

Briggs & Stelling, New York City, Landscape Architects

PLANNING SCHOOL GROUNDS TO ASSURE ECONOMICAL UPKEEP

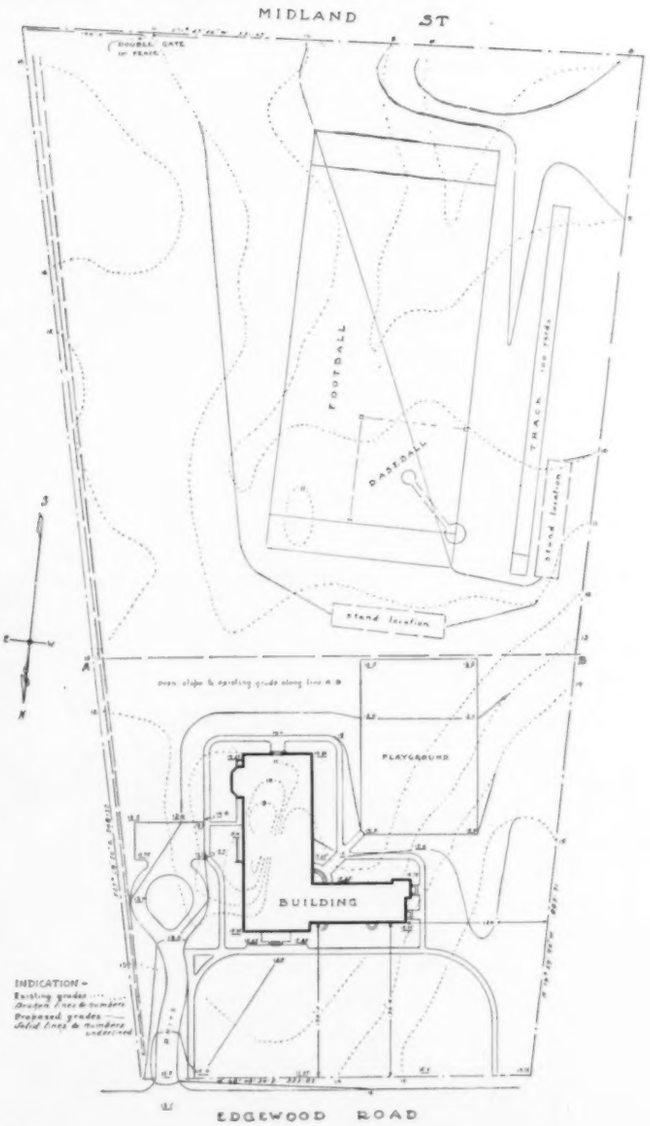
BY A. CARL STELLING

Briggs & Stelling, Landscape Architects, New York

THE values of well-planned landscape settings and out-of-door recreation facilities are being increasingly recognized, and the trend toward consolidation of school districts opens up rich opportunities for those who feel that it is unreasonable to build beautiful schools with little or no consideration for grounds development. As cost has been the greatest barrier to such development in the past, it is well to realize that it is possible to provide for the upkeep of attractive school grounds and outdoor athletic facilities at a cost only slightly above that regarded as a normal allotment for maintaining the ordinary school grounds. The grounds development for the Quogue Elementary and Junior High School at Southampton, Long Island, is a case in point.

At the Quogue School, Southampton, L. I.

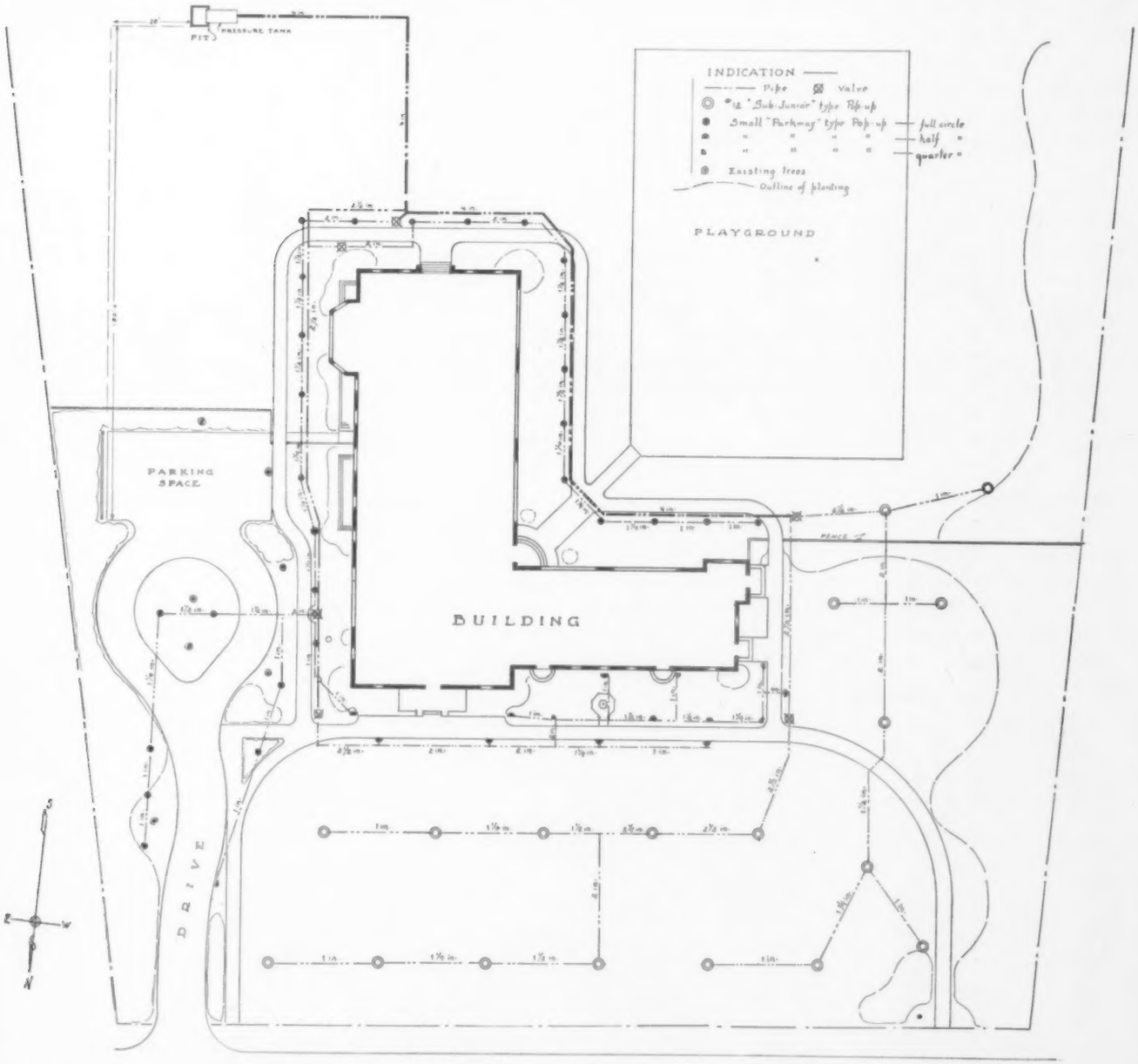
The accompanying plot plan of the Quogue school and grounds shows the facilities provided on a site of some ten acres. The entire grounds were laid out from the standpoint of appearance and practicability, cost of operation and permanency. In this connection careful attention was given to the location, orientation and elevation of the school building. It was thoroughly impressed upon the designers that very little more money than formerly could be provided for the continued maintenance of this ideal American school ground. How was this to be accomplished? With the



four seasons of the east in mind, the following recommendations were made for the construction and grading and the perpetual care of the grounds:

Good Top-Soil Essential.—Top-soil should be provided for the extensive planting required. As there was practically no top-soil in the vicinity of this particular school, a supply had to be hauled from a source ten miles away. As grass, plants and trees require good agricultural soil in order to thrive, this was not the gross extravagance that it might seem to anyone unfamiliar with conditions.

The Sprinkler System.—An adequate water supply should be assured, since irrigation must always be provided for. In this case the rates of the municipality seemed excessive for purposes of irrigation, so a well was driven to fulfill the requirements of 60 gallons per minute. With this quantity assured, plans were prepared for a centrifugal pumping station, a reserve tank and underground sprinklers. This installation cost only slightly more than the outlay necessary for ordinary hydrants placed at intervals about the grounds. In actual practice this watering system has proved most satisfactory: (1) The school grounds have a well-kept stand of green grass in midsummer when all other lawns are parched. (2) Everything is watered thoroughly and uniformly. (3) With eight sprinklers per section operating at once, the janitor can turn the various sections on or off every hour with



Layout of Underground Sprinkler System

two turns of the key arms without noticeable interference with his routine work in the building.

Walks and Drives.—Walks should be hard-surfaced; namely, concrete or flagstone. Driveways, parking areas, etc., should be given a well-crowned and drained sub-base of at least 6 inches, and an over-all thickness of at least 10 inches. The top courses should be penetrated with a bituminous material, not only to shed water, but to guarantee wearability. Good construction and drainage of walks and drives make them not only lasting but easy to clean at all seasons, particularly in winter.

Fencing.—In order to protect the property against trespassers when it is not under supervision, it should be enclosed with a suitable fence. A heavy chain-link fence, painted dark green, is preferable for playground purposes. It is entirely unnecessary and unsightly to erect a fence in front of a building, but fencing should connect the side property lines and the sides of the building. Convenient gates should be placed over walks and drives to permit circulation as may be required.

Time Saving on Lawn Mowing.—A power mower should be purchased, so that the entire lawn areas and athletic field can be cut in one day with minimum effort. Since most of the routine maintenance work is concentrated in the vacation season, when regular janitorial duties are lighter, the responsibility for keeping up the grounds can be assumed by a single janitor with these modern time-saving methods of watering and mowing at his disposal. The costs of all the mechanical features will be offset in three years' time through the annual saving of an extra man's salary.

Fertilizing and Pruning.—Fertilizing and pruning of trees and shrubs should be done every alternate year. Plants require feeding after they have become established, and the food supply in the soil gradually becomes exhausted. In nature the stronger plants survive the weaker ones by taking the available food supply. Although we strive to follow nature in our plantings, a somewhat artificial concentration is often necessary for architectural harmony. Because of such unnatural conditions, it is well to protect plants by fertilizing with rotted manure. This should be done after the ground has frozen in the colder regions and after dormancy in the warmer.

Pruning should be done by a competent gardener or tree surgeon. Every tree and shrub is an individual and therefore has a character all its own. Hedge shears are meant for uniform hedges only, and should never be used to trim a shrub. The method of pruning shrubs with hand pruners varies according to the specimen or type in question, but in general it amounts to "thinning out and reshaping." Stubs should never be left to rot and break off. All branches should be cut clean and close to the stem. To safeguard life and limb and thus avoid liability, trees should be trimmed only by an expert. Except where special instruments are used, the methods of shaping and pruning shrubs apply to trees. In addition, all cuts should be painted for protection against bleeding, insects and rot, and on old trees cavity work may also be required.

The following-out of these principles has brought excellent results at the Quogue school.

The initial cost for complete execution of grading, landscape construction work and planting of ten acres, and including all the aforementioned features, plus the fees for plans, specifications and supervision of work, did not exceed $20,000. However, unusual conditions of topography and soil can cause much fluctuation in costs.

As in this case the Georgian influence predominates architecturally, the building in no way presents an altogether institutional appearance, but rather lends itself to the surrounding countryside. Likewise, the grounds have been treated to blend with the building and the countryside, thus making a harmonious and everlasting composition.

LANDSCAPE ARCHITECTS FOR UNIVERSITY AND SCHOOL PROJECTS

The following directory is restricted to Landscape Architects who are in independent professional practice and have actually been identified with a number of university or school projects.

Space limitations permit only three listings for each individual or firm, and preclude mentioning either the name of the architect associated or the definite character of the work undertaken for each institution. It is believed that the majority of landscape architects specializing in school and university work are here represented, and that many of the projects listed have had a considerable influence on high-grade professional practice in the planning and planting of school grounds and college campuses throughout the United States.

CALIFORNIA

Ralph D. Cornell, 3723 Wilshire Blvd., Los Angeles
Pomona College, Claremont
Claremont Colleges, Claremont
University of Hawaii, Honolulu

Howard E. Gilkey, 2701 Van Ness Ave., San Francisco
Mills College, Oakland
Saint Mary's College, Moraga
Modesto Junior College, Modesto

John William Gregg, University of California, Berkeley
Campus development for the University of California at Berkeley, Los Angeles, Riverside, Davis, La Jolla and U. C. Hospital, San Francisco

H. W. Shepherd, 101 Agriculture Hall, Berkeley
Union High School and Junior College, Marysville
Branch College of Agriculture, Davis
Round Valley Union High School, Covelo

Ralph T. Stevens, 116 E. Sola St., Santa Barbara
University of California, Berkeley
Santa Barbara Public Schools, Santa Barbara
State Teachers College, Santa Barbara

Butler S. Sturtevant, Shreve Bldg., San Francisco
University of Washington, Seattle
Principia College, Elsah, Ill.
Principia School, St. Louis, Mo.

Paul G. Thiene, 705 Bradford St., Los Angeles
Alhambra High School, Alhambra
Santa Maria Union High School, Santa Maria
Excelsior Union High School, Norwalk

COLORADO

S. R. DeBoer, 515 E. Iliff Ave., Denver
Colorado Womans College, Denver
Ovid High School, Ovid
Wyoming State Training School, Lander

CONNECTICUT

Thomas H. Desmond & Associates, Inc., Simsbury
U. S. Coast Guard Academy, New London
Ethel Walker School, Simsbury
Westminster School, Simsbury

DISTRICT OF COLUMBIA

Joseph C. Gardner, 1700 I St., N.W., Washington
Woodrow Wilson High School, Washington
McKinley Senior High School, Washington
Horace Mann School, Washington

Rose Greely, 1707 I St., Washington
Madeira School, Greenway, Va.
Hillcrest-Washington City Orphanage
New York Military Academy, Cornwall-on-Hudson

FLORIDA

Frank M. Button, 913 Avenue Majorca, Coral Gables
University of Vermont, Burlington, Vt.
Ponce de Leon High School, Coral Gables
Millikin University, Decatur, Ill. (Partner of Simonds Co.)

Herbert L. Flint, Woolworth Bldg., Orlando
Mount Union College, Alliance, Ohio
Newport School, Ironwood, Mich.
Rollins College, Winter Park

ILLINOIS

Jacob L. Crane, Jr., Wrigley Bldg., Chicago
Lawrence College, Appleton, Wis.
High School, Ponca City, Okla.
Chicago Board of Education (64 schools)

Chance S. Hill, 1333 Maple Ave., Downers Grove
North Central College, Naperville
Northern Illinois State Teachers College, DeKalb
Main Township High School, Des Plaines

F. A. Cushing Smith & Associates, 431 Central Ave., Wilmette
St. Agnes School, Albany, N. Y.
Rockford College, Rockford
Medical and Dental College, University of Illinois, Chicago

INDIANA

Donald B. Johnston, Architect's and Builder's Bldg., Indianapolis
Miami University, Oxford, Ohio
School, Richmond
Earlham College, Richmond

Lawrence V. Sheridan, Brendonwood, Indianapolis
Purdue University, Lafayette
St. Mary of the Woods Academy, Terre Haute
Shortridge High School, Indianapolis

MAINE

Beatrix Farrand, Reef Point, Bar Harbor
Yale University, New Haven, Conn.
Princeton University, Princeton, N. J.
University of Chicago, Chicago, Ill.

MARYLAND

Irving W. Payne, 4017 Leland St., Chevy Chase
Georgetown Preparatory School, Garrett Park
The Miss Madeira School for Girls, Greenway, Va.
Lanham Grade School, Lanham

MASSACHUSETTS

Robert Washburn Beal, 185 Devonshire St., Boston
Eldon Keith Field, High School, Brockton
Bowdoin College, Bowdoin Athletic Field, Brunswick, Maine
High School Campus and Athletic Field, Whitman

Franklin Brett, Franklin St., Duxbury
Marshfield High School, Marshfield
Weston High School, Weston
Duxbury High School, Duxbury

Laurence S. Caldwell, 45 Bromfield St., Boston
Vassar College, Poughkeepsie, N. Y.
Bates College, Lewiston, Maine
Belmont High School, Belmont

Herbert J. Kellaway, 12 West St., Boston
Amherst College, Amherst
Middlebury College, Middlebury, Vt.
Oak Hill School, Newton

Warren H. Manning, Brattle Bldg., Cambridge
Virginia Polytechnic Institute, Blacksburg
Randolph-Macon Woman's College, Lynchburg, Va.
Massachusetts State College, Amherst
Advise reports or plans for 75 educational institutions in United States and Canada in 30 years.

John Nolen, Harvard Square, Cambridge
Babson Institute, Wellesley
Queens College, Charlotte, N. C.
University of Wisconsin, Madison, Wis.

Olmsted Brothers, 99 Warren St., Brookline
Phillips Academy, Andover
Denison University, Granville, Ohio
Duke University, Durham, N. C.

Bremer Whidden Pond, 5 Boylston St., Cambridge
University of New Hampshire, Durham, N. H.
Southern Methodist University, Dallas, Texas
Radcliffe College, Cambridge

William H. Punchard, 11 Harding Ave., Belmont
Woburn High School Athletic Field, Woburn
Middlebury College, Middlebury, Vt.
Abbot Academy, Andover

Arthur A. and Sidney N. Shurcliff, 11 Beacon St., Boston
Amherst College, Amherst
Mount Holyoke College, South Hadley
Groton School, Groton

MICHIGAN

Carol H. Lawrence, 536 Academy St., Kalamazoo
Kalamazoo College, Kalamazoo
Western State Teachers College, Kalamazoo
University of Rochester, Rochester, N. Y.*

T. Glenn Phillips, Charlevoix Bldg., Detroit
Michigan State College, East Lansing
Sacred Heart Seminary, Detroit
University of Detroit, Detroit

H. O. Whittemore, University of Michigan, Ann Arbor
Nichols Arboretum, University of Michigan
Ann Arbor Public Schools
Hartland Consolidated School, Hartland

Raymond Hill Wilcox, 1047 Whittier Blvd., Detroit
Duns Scotus College, Detroit
Starr Commonwealth for Boys, Albion
Grosse Point High School, Grosse Point

MINNESOTA

Morell & Nichols, Inc., 1200 Second Ave., South, Minneapolis
University of Minnesota, Minneapolis
Washington State College, Pullman
Carleton College, Northfield

MISSOURI

Hare & Hare, 114 W. 10th St., Kansas City
University of Texas, Austin
Wyandotte High School, Kansas City, Kans.
63 Schools, Fort Worth, Texas

John Noyes, Railway Exchange Bldg., St. Louis
Mary Institute, St. Louis
St. Louis Country Day School, St. Louis
Webster Groves Schools, Webster Groves

NEW JERSEY

Brinley & Holbrook, 21 South St., Morristown
Trenton Teachers College, Trenton
N. J. Training School for Colored Youth, Bordentown
Teachers College, Montclair

Michael M. Burris, Englewood
Dwight Morrow High School, Englewood
High School Athletic Fields and Play Areas, Princeton
High School Athletic Fields and Play Areas, Hasbrouck Heights

Marjorie Sewell Cautley, Ridgewood
Fieldston School Campus, Riverdale, N. Y.
Tenafly High School Grounds, Tenafly
Roosevelt Common Athletic Field, Tenafly

NEW YORK

Briggs & Stelling, 10 E. 40th St., New York (also Charleston, S. C.)
Quogue Grade School, Southampton
Junior and Senior High School, Dobbs Ferry
Glenn H. Curtiss Memorial School, Hammondsport

A. F. Brinckerhoff, 101 Park Ave., New York
Connecticut College, New London
Trinity College, Hartford, Conn.
Wesleyan University Infirmary, Middletown, Conn.

Harold A. Caparn, 144 E. 30th St., New York
Lebanon Valley College, Annville, Pa.
Brooklyn Botanic Garden, Brooklyn
Manhasset Valley School, Manhasset

Laurie D. Cox, 136 Kensington Place, Syracuse
Acadia University, Wolfville, Nova Scotia
Hudson High School Athletic Field, Hudson
Olean High School, Olean

Alling S. DeForest, 16 Fair Place, Rochester
High School and North Street School, Geneva
Villa Chantill, Rock Island, Ill.
Colgate-Rochester Divinity School, Rochester

Byrant Fleming, Wyoming
Cornell University, Ithaca
Toronto University, Toronto, Canada
District School, Wyoming

* While with Pitkin & Mott, Cleveland, Ohio.

Francis Hastings Gott, 311 Alexander St., Rochester
Charlotte High School, Rochester
Brockport High School, Brockport
Nazareth College, Pittsford

Harries & Reeves, 110 Franklin St., Buffalo
Park Adjoining High School, Portville
High School, Wilson
Athletic Field, Lockport

Roeder J. Kinkel, 117 Russell Ave., Buffalo
Evangelical Training School, Dunkirk
Batavia High School, Batavia
Alfred University, Alfred

Charles Downing Lay, 515 Madison Ave., New York
High School, Watertown, Conn.
Union College, Schenectady
New York State Normal Training School, Cortland

H. B. Littlefield, "Little Field," North White Plains
Central High School, Hancock
High School of White Plains, and Stadium, White Plains
Battle Hill School, White Plains

Charles N. Lowrie, 101 Park Ave., New York
Yale University Athletic Fields, New Haven, Conn.
Lawrenceville School, Lawrenceville, N. J.
Oyster Bay Junior High School, Oyster Bay

William Pitkin, Jr., and Seward H. Mott, Inc., 36 St. Paul St., Rochester
University of Michigan, Ann Arbor
Kent State University, Kent, Ohio
Wooster College, Wooster, Ohio

Richard Schermerhorn, Jr., 342 Madison Ave., New York
St. Anthony's Seminary, Catskill
Albany Academy, Albany
Rensselaer Polytechnic Institute, Troy

Jacob John Spoon, Inc., 4 Orchard Drive, White Plains
Academy of St. Joseph-in-the-Pines, Brentwood
Penn. Township School Dist. High School Grounds, Bernville, Pa.
Central School District No. 1, Pine Plains

Vitale & Geiffert-Gilmore D. Clarke, 101 Park Ave., New York
University of Illinois, Urbana
Virginia Military Institute, Lexington
New Jersey College for Women, New Brunswick

OHIO

B. Ashburton Tripp, 821 Guarantee Title Bldg., Cleveland
High School, Parkersburg, W. Va.
High School, Shaker Heights
High School, Cleveland Heights

PENNSYLVANIA

Wheelwright & Stevenson, 225 S. 15th St., Philadelphia
The Gunnery School, Washington, Conn.
St. Andrews School, Middletown, Del.
Muhlenberg College, Allentown

UTAH

Harold L. Curtiss, U. S. Forest Service Bldg., Ogden
John Muir Junior College, Pasadena, Calif.
Park County Union High School, Cody, Wyo.
University of Wyoming, Laramie

VIRGINIA

Albert A. Farnham, 1240 White Oak Road, Roanoke
Hollins College, Hollins
Virginia Polytechnic Institute, Blacksburg
Jefferson High School, Roanoke

Charles F. Gillette, 105 E. Cary St., Richmond
College of William and Mary, Williamsburg
Mary Baldwin College, Staunton
The Novitiate, Jesuit College, Wernersville, Pa.

WISCONSIN

Phelps Wyman, 759 N. Milwaukee St., Milwaukee
State Teachers College, Milwaukee
South Dakota School of Mines, Rapid City
Lincoln High School, Wisconsin Rapids

CANADA

Arthur M. Kruse, 50 High Park Blvd., Toronto, Ontario
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Woodstock College, Woodstock, Ontario
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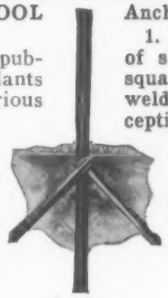

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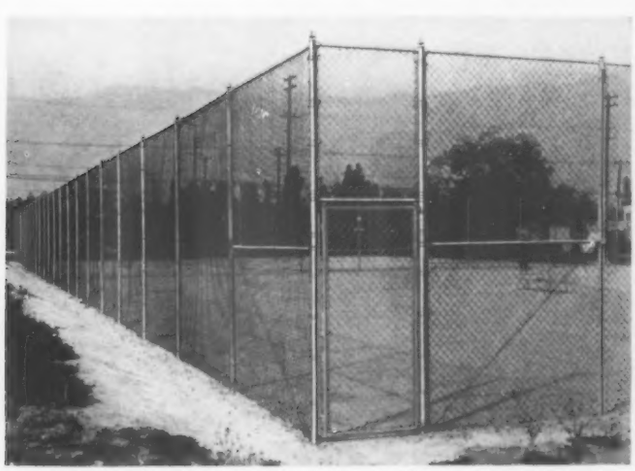

Anchor Chain Link Tennis Court Enclosure at Pasadena High School, Pasadena, Calif.

Anchor-Weld Fence Surrounding the Hartford High School, Hartford, Conn.

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Henry A. Dreer, Inc., Philadelphia, Pa.
I. E. Ilgenfritz' Sons Co., Monroe, Mich.
Mount Arbor Nurseries, Shenandoah, Iowa
Shenandoah Nurseries, Shenandoah, Iowa
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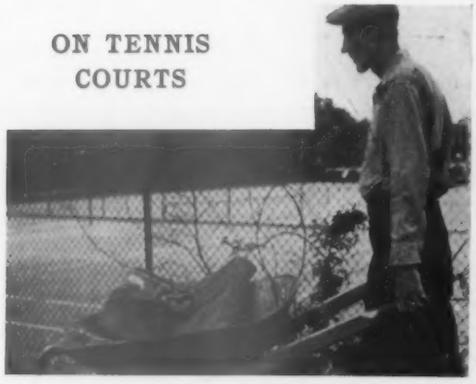

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Fabric of KONIK, containing copper, nickel and chromium—a stronger steel, rust-resistant clear through. Wire gauge No. 9 or No. 6 woven into a 2 inch chain mesh, Hot Dip Galvanized after weaving. Zinc coating, by weight not less than 1.2 oz. per square foot, will withstand an average minimum of six one-minute immersions by the Preece test. Tensile strength not less than 85,000 pounds per square inch. Top and bottom selvages of fabric are barbed.

Line Posts

H-Section, weight 4.3 pounds per foot or 2½" O.D. tubular pipe, weight 3.65 pounds per foot. Spaced not more than 10 feet apart, on centers.

Line Post Arms

Forty-five degree angle or vertical arm of No. 12 gauge pressed steel riveted to malleable base, carrying 3 strands of barbed wire. Barbed wire attached to arm in angle slot, being automatically locked in place by tension.

Top Rail

Tubular steel pipe 1⅝" O.D. weight 2.28 pounds per foot; provided with 7" long inside and outside expansion sleeve couplings.

Fabric Ties

No. 6 gauge, round aluminum. Six furnished to each 10 feet of rail and one to each foot of line post height.

Barbed Wire

Three strand, 4 point pattern, Hot Dip Galvanized after fabrication.

Tension Wire

No. 6 gauge, coiled spring wire used with no top rail construction at top of fabric.

Terminal Posts

Tubular steel pipe; End, corner and Pull Posts 3" O.D. weight 5.79 pounds per foot. Gate posts 3" O.D. or larger, depending on width of gates.

Terminal Post Tops and Arms

Fitted with heavy malleable iron arms to carry barbed wire.

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Beveled edge type, slotted to receive special lock pin, eliminating bolts and nuts.

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Single and double types, frames of heavy-tubular pipe, corners fitted with heavy malleable iron castings or electrically welded. Manually or mechanically operated.

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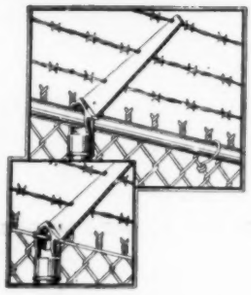
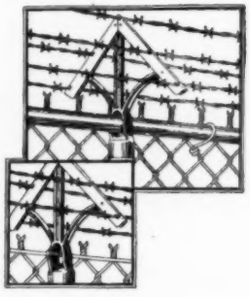
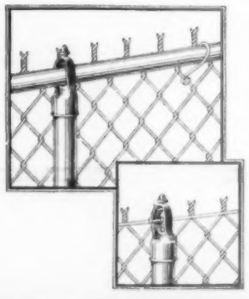


Style 3B - R— Three strands of barb wire with top rail. Style 3B-W— Same with No. 6 gauge tension wire instead of top rail.



Style 5B - R— Five strands of barb wire with top rail. Style 5B-W— Same with No. 6 gauge tension wire instead of top rail.

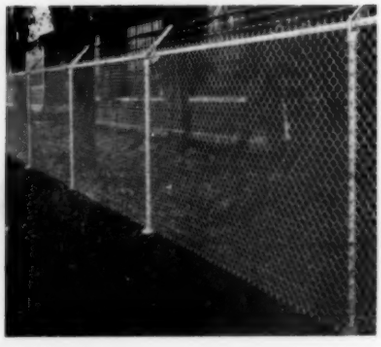


Style NB-R— No barb wire with top rail. Style NB-W— Same with No. 6 gauge tension wire instead of top rail.

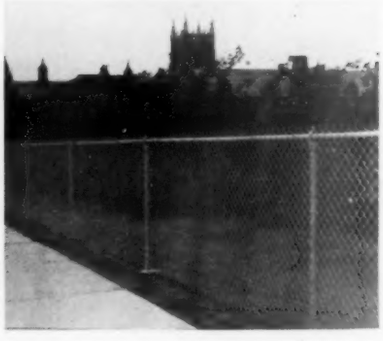
CONTINENTAL "Chain Link" FENCE

Style 5B-R

Style 3B-R



Style NB-R



COOPER MANUFACTURING COMPANY INC.

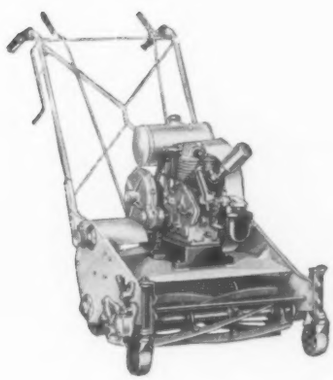
4112 South First Avenue
Marshalltown, Iowa, U. S. A.

Cooper POWER MOWERS
FOR EVERY LAWN REQUIREMENT

Cooper Classic
27-inch

A DeLuxe model Roller Type Mower designed for easy handling and fast, efficient mowing. Ball Bearings and Alemite lubrication thruout. Easy starting, crank type Briggs & Stratton 1 H. P. 4 cycle Engine. Engineered like a modern motor car. Streamlined aluminum alloy deck gives strength and rigidity. Weed Clipper, Grass Catcher, Triplex Units, Riding Attachment and 2 H. P. Engine optional equipment at small additional cost.

Cooper Royal
20-inch



The 20-inch Royal Model offers the same high class features of the larger mower and is recommended for plots of three acres or less. Construction follows closely that of the 27-inch machine and includes direct drive from motor, a specially designed Cooper Reel together with a very simple reel adjustment to the bed plate which is instant and positive.

Cooper Clipper
18-inch

The Cooper Clipper is a full size 18-inch well powered wheel type unit of rugged and proved construction. "Hinged Power" transmitted directly to the reel requires no clutches and does away with many wearing parts. Simplified takeup for chain and belt eliminates service worries and repairs. A low priced unit for small plots where time and labor saving is a factor.

Descriptive literature on all models free on request

CYCLONE FENCE COMPANY

UNITED STATES STEEL

General Office: Waukegan, Illinois

North Chicago, Ill.
Waukegan, Ill.

Cleveland, Ohio
Newark, N. J.

Fort Worth, Texas
Greensburg, Ind.

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PACIFIC COAST DIVISION
STANDARD FENCE COMPANY

Los Angeles | San Francisco | Oakland, Calif. | Portland, Ore. | Seattle, Wash.

Cyclone Fence is produced and erected by the world's largest manufacturers of property protection fencing. For years the Cyclone Fence Company has specialized in fencing school property. Cyclone Fence is the recognized standard for every school and playground purpose.

Enclose your school grounds with genuine Cyclone Fence to provide maximum protection for your school children.

Cyclone Safeguard Chain Link Fence for School Grounds, Playgrounds, Parks, Institutions, Etc.

Fence your school Athletic Field with Cyclone and get more paid admissions to every game.

Because of its long, trouble-free service, you will find Cyclone Fence most economical in the end.

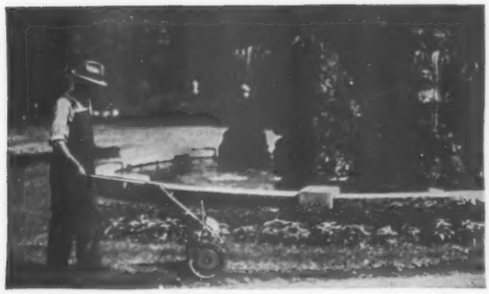
Learn how to test the value of any chain link fabric **before you buy.** Ask for a copy of the booklet "Fence—How to Choose It—How to Use It" and the Cyclone "12m" folder which shows how Cyclone's "12m" process of extra heavy galvanizing means longer fence life.

Cyclone Invincible Chain Link Fence for Athletic Fields

Cyclone Window Guards are sturdy—save money

EVINRUDE MOTORS MILWAUKEE

4143 North Twenty-Seventh Street,
Milwaukee, Wisconsin



(Full 18 inch swath)

THE MODERN, ONE-HAND, LOW-COST MOWING MACHINE

More and more schools are finding the answer to their complicated mowing problems in the Lawn-Boy, the modern, one-hand, low-cost, light weight mower. Extremely maneuverable because of its compactness and free wheeling features, the Lawn-Boy is really unsurpassed for mowing in congested, uneven grass and stone-infested areas and easily outmows many larger mowers on open areas.

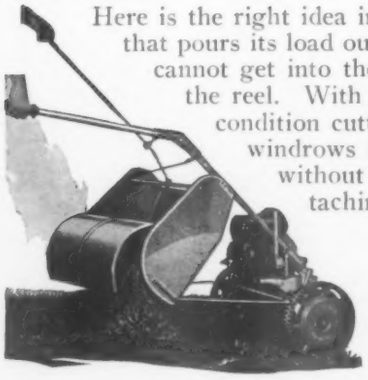
CUTS CLOSER

Lawn-Boy design permits the machine to mow closer to curbs, walls, trees and hedges than most hand mowers and power mowers. A twist of the handle locks it for quick cutting with power that does away with costly, laborious hand trimming.

CUTS UNIFORMLY—4 CUTTING HEIGHTS

Lawn-Boy cuts more smoothly in troughs, on crests, up or down hill. Simple wheel adjustment provides ⅝", 1", 1⅜" or 1¾" cut.

ONE-HAND ALL-METAL GRASS CATCHER



Here is the right idea in grass catchers—one that pours its load out the back so cuttings cannot get into the mower and clog up the reel. With grass in a dry, loose condition cuttings drop easily into windrows as you walk along—without stooping, without detaching the catcher.

Price. . . .$8.50

12 BIG FEATURES—COMPLETE FREE CATALOG

12 unique Lawn-Boy features are shown in our complete catalog-folder. Send for a copy today.

EASY, ONE-HAND MOWING

LAWN BOY Power Mower

The operator needs only to guide the Lawn-Boy with a light carry-grip on the control handle. The instant he pulls back on the handle the mower **stops.** Motor and reel keep on running, but the drive wheels are disengaged. Normal release of the control handle again sets the drive wheels in motion. Operating a Lawn-Boy is so natural that it seems that the mower and operator are one, so perfectly does it obey the hand that guides it. There is no weight on the handle, and there is no side to side jerking. Lawn-Boy mowing is easy one-hand mowing that does not jerk or jar the operator. That is why Lawn-Boys can be operated hour after hour and easily outmow much larger mowers.

LIGHT WEIGHT—RUNS ALL DAY ON 20c. WORTH OF FUEL

Lawn-Boy is sturdily built for day-in, day-out heavy mowing. Compact, clever designing keeps weight low, resulting in easy handling and low operating cost.

AUTOMATIC STOP CONTROL

Occasionally the operator may wish to stop mowing to remove some object in his path. He merely drops the handle . . . Lawn-Boy stops instantly . . . the motor keeps running . . . mowing is resumed by merely returning the handle to normal position. Operation is so simple, so automatic—a mere boy operates the Lawn-Boy easily.

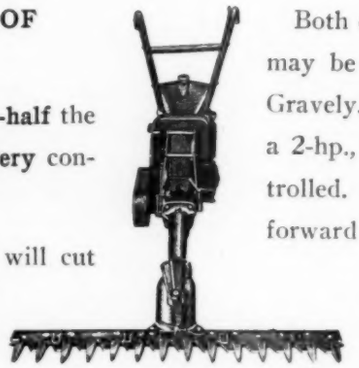
Only $110
With Rubber Tires F.O.B. Milwaukee
Almost automatic One-Hand Control. Gives new ease of operation.
Sturdy 4-Cycle Engine

GRAVELY MOTOR PLOW & CULTIVATOR CO.

Box 414, Dunbar, W. Va.

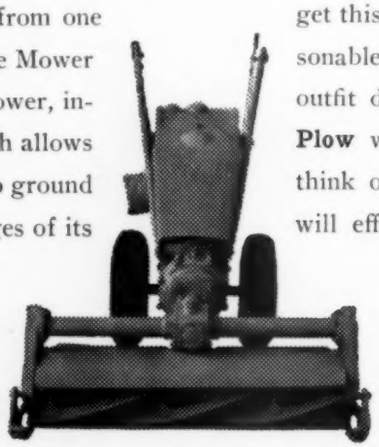
TWO MOWERS FOR THE PRICE OF ONE

Why buy a mower that does only **one-half** the job? The Gravely will work under **every** condition.



1. The **Power-Driven Sickle Mower** will cut high grass — weeds — rough places — spots where you've heretofore had to use hand scythes—even sprouts a full ¾-inch thick—and a great big swath every time.

2. A practical, sturdy 30-inch **Reel Type Motor** can be attached to the very same tractor. By simply removing a few bolts, you can change from one attachment to the other. The Reel Type Mower has all the advantages of the Sickle Mower, including the patented swivel action which allows the bar or mower to slant to conform to ground contour; and it has additional advantages of its own. Its cutting unit moves smoothly over the lawn, cutting the grass at a uniform height at all times—a feat impossible for a cutting unit having wheels and rollers. Dips and sags are cut as evenly as level ground.



30" Reel Type Mower on Model L Tractor

Both of these mowers, and other attachments, may be used on either **Model D** or **Model L** Gravely. **Model D** (see illustration at left) has a 2-hp., 4-cycle motor, one speed, throttle-controlled. **Model L** has a 5-hp., 4-cycle motor, 2 forward speeds and 1 reverse.

USE YOUR GRAVELY ALL THE YEAR 'ROUND

If you already own a Gravely, you will be interested to know that this small sidewalk snow plow can be readily and quickly attached to the same tractor. Having already made the largest investment, you can get this new snow plow attachment at very reasonable cost, and make effective use of your outfit during the winter. The **Gravely Snow Plow** will go in places where you wouldn't think of taking the big type machine, and it will effectively clear a path 40 to 54 inches wide. You can easily adjust both the width and the manner of throwing the snow.

Specifications, prices or demonstration will be gladly given on request.

IDEAL POWER LAWN MOWER CO.

438 Kalamazoo Street, Lansing, Mich.

FACTORY BRANCHES

New York
12 Harrison St., New Rochelle, N. Y.

Detroit
161 Vester Ave., Ferndale, Mich.

A COMPLETE LINE OF ROLLER TYPE AND WHEEL TYPE POWER MOWERS, TRACTOR MOWERS AND GANG MOWERS

IDEAL "MASTER"—Roller Type

Two Sizes—25″ cut, 30″ cut

A combination power mower and roller of simple design and extra sturdy construction for heavy duty service. Well adapted to large open areas where continuous hard daily service is encountered, and where long life and low upkeep are essential.

Extra equipment—Trailer Units (on 30″ model)—Riding Sulky, Grass Catcher.

IDEAL "VICTOR"—Wheel Type

Two Sizes—22″ cut, 30″ cut

The Victor model wheel type mower is made in two sizes. A light weight, easy handling machine recommended for use on lawns where there is a large amount of close cutting around trees, shrubbery, etc. Available with steel wheels or air tires.

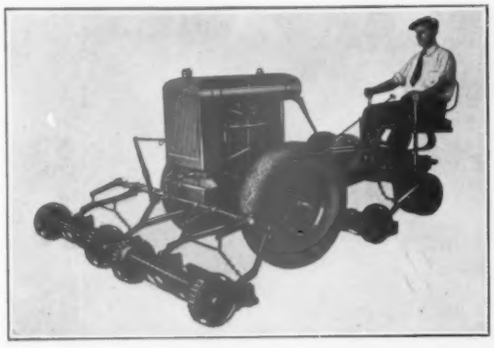
Extra equipment—Weed Cutter, Grass Catcher; and on 30″ size Riding Sulky, Trailer Units.

IDEAL "MAJESTIC"—Roller Type

Two Sizes—22″ cut, 30″ cut

A roller type mower with power driven reel—recommended for use on extra fine, smooth lawns where a close, clean high quality cutting job is demanded. Used extensively on lawns of Creeping Bent and Bermuda. Close coupled, compact and easily handled around shrubbery, flower beds, etc.

Extra equipment—Weed Cutter, Grass Catcher; and on 30″ size Riding Sulky, Trailer Units.



IDEAL POWER TRIPLEX

Junior Model 70″ cut—Senior Model 84″ cut

For mowing jobs where big capacity is demanded the Ideal Triplex has no equal. Capacity up to 35 acres per day. Power steered. All three units cut ahead of tractor wheels. Hand lever to lift units off the ground. Quickly and safely transported from one job to another.

Extra equipment—Snow Plow for sidewalks and driveways.

For full Details and Prices, Write for our General Catalog

JACOBSEN MANUFACTURING CO.

740 Washington Ave., Racine, Wisconsin

FACTORY BRANCH: 101 Park Ave., New York

POWER MOWERS FOR LAWNS OF EVERY SIZE

TO provide the greatest economy in caring for lawns of every character, Jacobsen Power Lawn Mowers are built in both wheel and roller types, with cutting widths ranging from 20 inches to 64 inches and price from $135.00 up. Each model is designed for a specific type of service by America's foremost power mower engineers.

Jacobsen Power Mowers are now used by schools and universities in all parts of the world for cutting every kind of grass. No matter what type or size lawn you have to cut, you can select a "Jacobsen" that will fit your requirements with the assurance that no other power mower offers such fine engineering, sturdy construction, efficient performance and economical operation.

The "TWIN" and Power-Driven Side Units

The Jacobsen "Twin" is the biggest, fastest self-propelled power mower on the market. On large acreages it brings the per-acre cost of mowing to the lowest figure yet attained. With 32-inch cut and plenty of power for steady operation at 4 miles an hour, the "Twin" has a capacity of easily an acre an hour. The new motor-driven side units double the width of cut and capacity of the "Twin." Their frequency of cut is the same as the "Twin"—and they work right over the edges of walks or spaded beds, under shrubbery and close to trees, eliminating most hand trimming. (Power-driven wing units are also available for the "Estate 30" roller-drive model.)

"4-ACRE" And Power-Driven Trimmer Unit

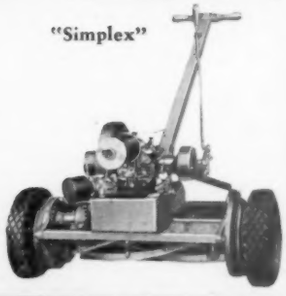
Introduced in 1921, the "4-Acre" has each year entrenched more firmly its position as the all-around favorite for schools and universities. Year by year the "4-Acre" has been refined in details of construction and major improvements have been added from time to time. Its newest feature is the power-driven trimmer unit for the 24-inch model. It reaches under shrubbery, over the edges of walks, curbs, spaded beds and trims within two inches of obstructions. The trimmer has a cutting width of 14 inches. When folded it leaves the "4-Acre" its regular front and side clearance.

CUTTING WIDTHS FROM 20 TO 64 INCHES . . . WHEEL AND ROLLER DRIVE

"Estate 30"

"Estate 20"

"Sturdex"



"Simplex"

SEND FOR DESCRIPTIVE CATALOG OF JACOBSEN POWER MOWERS

MARCH AUTOMATIC IRRIGATION CO.

Muskegon, Michigan

Presenting the Latest Development in Portable Watering Systems

MARCH TRAVEL-RAIN SPRINKLER

Waters More Than One Acre per Setting

TRAVELING SPRINKLER WITHOUT FAULT

Operates on normal pressure of 40 lbs. or more. Covers strip up to 125 ft. x 200 ft. long. Ideal for Polo Fields, Cemeteries, Football Fields and Athletic Fields where outlets on the field itself are not desired. Write for additional information.

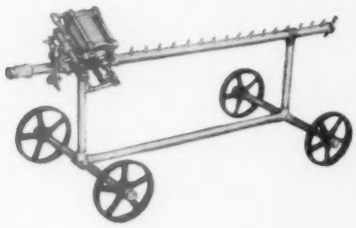
UNDERGROUND SPRINKLER SYSTEMS BY MARCH

Underground systems are already established as the finest type of sprinkling for large grass areas. Complete coverage with a fine mist at the turn of a valve. Especially adapted to cemeteries and parks. Submit your plan to our Engineering Department for layout.

MARCH AUTOMATIC RAINMAKER

For Many Years the World's Finest

The March Rainmaker has stood out for years as the world's finest portable sprinkler. Large coverage, even distribution, square watering and



absolute dependability are its outstanding points.

Groundskeepers especially will find the Rainmaker a labor saver. An installation often pays for itself within two years from labor saved alone. The Rainmaker is well worth your investigation.

The March catalog covers every type of sprinkler equipment and is available for the asking. Drop us a line letting us know what your particular problem is, our Engineers are at your service at all times.

March Underground System in Use

March Rainmakers Watering on Schedule

THE MOTO-MOWER COMPANY

MAIN OFFICE
4600 Woodward Avenue
Detroit, Michigan

TWO OUTSTANDING MODELS--

OF THE Moto-Mower LINE

FOR ECONOMICAL AND EFFICIENT PERFORMANCE

THE SUPER-DETROIT

Big and powerful but as responsive to the touch as a light hand-mower through "Twist of the Wrist" guiding. An operator can mow five or six acres a day every day of the season without fatigue. Among other outstanding features are 4-cycle L-head motor, selective automatic speed control, safety clutch, drop-out cutting reel. Also pneumatic tires 15 x 4½ at reasonable extra charge. Write for complete information.

THE LAWNMASTER

Particularly recommended for areas with fine lawns which require trimming of turf along driveways. Mowers may be operated as a trimmer with the cutting reel extended over the edges of the depression. Features include separate clutch for traction and reel, detachable cutting unit, throw-out reel clutch, and safety clutch. 4-cycle L-head, air-cooled motor, etc. Available in 30″.

OTHER MOTO-MOWER MODELS ARE

Standard model—24″ cut; 4-acre daily cutting capacity; iron wheels or pneumatic, 14 x 4; reasonable extra cost.

Super-Detroit with 2 trailer units—66″ cut; 12 acres a day cutting capacity.

City model—21″ cut; 2 or 3 acres daily cutting capacity.

Standard Heavy Duty model with 2 trailer units: 60″ cut; 10 acres a day cutting capacity.

Fleetway—32″ cut; includes all desirable features both of a wheel and roller mower. Also available with extra gauge cutting units and sulky.

Junior model—19″ cut.

THERE'S A MOTO-MOWER DEALER NEAR YOU

Moto-Mower

WRITE FOR OUR COMPLETE CATALOG OF MOTO-MOWERS

PITTSBURGH STEEL COMPANY

Union Trust Building, Pittsburgh, Pa.

New York Chicago San Francisco Philadelphia Los Angeles Charlotte
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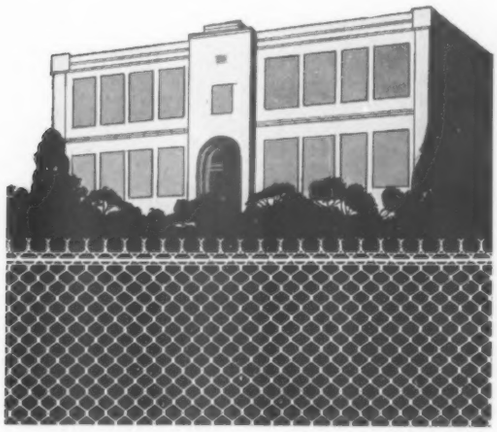
PITTSBURGH CHAIN LINK FENCE . . .



. . . for SCHOOLS and PLAYGROUNDS

Pittsburgh Chain Link is the ideal type of fence for school yard enclosures, playgrounds, athletic fields, swimming pools, tennis courts and for such other installations as require a maximum of strength and long life combined with a maximum of good looks and a full measure of true economy. The main features which go to make Pittsburgh Chain Link Fence outstanding in its field are:

Note: Complete detailed specifications gladly furnished upon request.

1. THE FABRIC—which is full-gauge, copper-bearing, open-hearth steel wire, heavily hot zinc coated after weaving. This fabric is available in many weights and mesh-sizes to meet all varieties of service needs.

2. THE FRAMEWORK—which combines solid H-Section or seamless steel pipe line posts with copper-bearing seamless steel pipe terminal posts, top rail and gate frames.

3. THE FITTINGS—in the design of which have been incorporated every possible feature to make for strength, convenience and ease of application and use. Fence fittings are no mean index of the value of a finished fence job. Expense spared here, although perhaps permitting some play in price, seldom fails to make itself known after a few years of usage. Pittsburgh fittings are all highest quality pressed steel and malleable iron for long service.

4. THE SERVICE—which Pittsburgh Steel Company is ready to furnish. If you want complete erection service, we'll provide expert erection men to do your entire job for you. If you prefer to erect your own fence with your own labor, we'll work with you to whatever extent you may need us. Our Engineering Department is set up to act in an advisory as well as a planning capacity.

Pittsburgh Chain Link Fence is the product of more than 35 years of steel and fence manufacturing experience. This company has always made quality products—and quality products only—under continuous rigid inspection from the ore to the finished materials. You may feel safe in accepting our guarantee of complete satisfaction with any Pittsburgh Product.

Pittsburgh Steel Company also manufactures Ornamental Lawn Fences; Estate, Residential and Industrial Fences; Farm and Poultry Fences; Stainless Steel Wire; Annealed Wire; Barbed Wire; Galvanized Wire; Spring Wire; Nails; Staples; Welded Wire Reinforcing for Streets, Sidewalks, Highways and General Construction; Steeltex (wire reinforcing mesh with integral fibrous backing) in styles for brick, stucco or plaster. Please write for further information.

O. M. SCOTT & SONS COMPANY

Marysville SCOTT'S GOLF COURSE SEEDS Ohio

Lawn Care

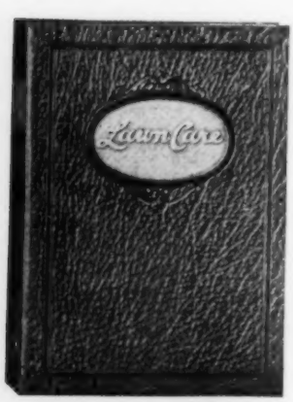
Grass growing presents many and intricate problems—most of which someone has solved.

In a little publication called **Lawn Care** this firm distributes a wealth of information on lawn matters. Much space is devoted to weed and other pest control.

Lawn Care doesn't represent what one or a dozen persons know or think about a certain problem. It is a condensation of the experiences of hundreds of competent authorities and laymen.

If you are not receiving **Lawn Care** you need only ask for it. A full set of the bulletins thus far published will be sent without charge, in a convenient loose-leaf binder which will make a valuable addition to your lawn files.

Scott's Seed is known the country over for its dependable quality. It has produced fine turf on more than 1500 golf courses and is the preference of scores of colleges, universities and high schools for the athletic field and campus.



Choose Scott's Seed and save yourself weed worries.

SCOTT'S LAWN SEED

For Parks, Lawns, Golf Courses and Airports.

Scott's Lawn Seed made its début years ago as a practically weedless, chaffless mixture. Every grass put into it represented the highest standard of quality. The original formula, varied only in recent years to include Bent, comprises only those grasses that make for a good, permanent lawn. The demand for such seed first came from discriminating home owners, then from landscape architects and other users of pure seed, and the mixture is now being sown in every grass-growing state and province in the United States and Canada. If our reputation as seedmen is of any consequence today, it is because years ago we conceived the ambition to sell purer seed than anyone else.

SCOTT'S SHADY MIXTURE

Scott's Shady Mixture is a combination that has given phenomenal success where other shady mixtures have failed completely.

BOOKLETS

"The Putting Green"
"Lawn Care" (House Organ)
"Bent Lawns"
"Airports"
"Scott's Field Seed Guide"
"Scott's Turf Builder"

SOCONY-VACUUM OIL COMPANY, INC.

STANDARD OIL OF NEW YORK DIVISION

26 Broadway, New York, N. Y.

The De Veaux School for Boys, Niagara Falls, N. Y.
Road Construction with Socony Asphalt Products

SOCONY ASPHALT BINDERS "B" AND "C"
SOCONY COLD PATCH ASPHALT

STANDARD BRAND
SOCONY ASPHALTS

SOCONY LIQUID ASPHALT
SOCONY ASPHALT PAVING FILLERS

Asphalt Macadam Roads

Asphalt Macadam Roads built by the Penetration Method are recognized by leading engineers as one of the most durable types of construction, being economical in cost and maintenance. This type presents a non-skid, all-weather surface, ideal for school and university grounds.

Socony Asphalt Binders "B" and "C" are widely used for such construction, in amounts varying from 2 to 3 gallons per square yard, being applied at temperatures ranging from 275 degrees to 350 degrees.

For Surface Treating of Gravel Roads and Paths

For economical treatment of dirt and gravel roads and paths, where it is desired to lay the dust and protect the surface with an Asphaltic mat, Socony Liquid Asphalts are produced in different grades to meet particular requirements. Socony Liquid Asphalts are usually applied in amounts varying from ¼ to ½-gallon per square yard and require a cover of sharp sand or clean gravel.

For Repairing Road and Path Surfaces

Socony Cold Patch Asphalt is an ideal patching material for repairing holes, ruts and depressions in all types of bituminous road surfaces. It is equally effective for restoring worn, uneven surfaces of brick and wood block pavements.

For each cubic yard of ½-inch to ¾-inch dry stone, we recommend the use of about 16 gallons of Socony Cold Patch Asphalt. Socony Cold Patch Asphalt is used without heating and is workable the year round.

For Filling Joints of Brick and Concrete Pavements

Socony Asphalt Paving Fillers (Standard Brand) for filling joints of brick, granite, and concrete pavements are especially refined Asphalts of high melting point. We also supply Asphalt Fillers containing mineral matter. Either of these grades is poured or squeezed to produce a rigid pavement.

THE STEWART IRON WORKS COMPANY

"Fence Builders to America Since 1886" INCORPORATED

303 Stewart Block, Cincinnati, Ohio

PRODUCTS

Bronze Tablets
Chain Link Wire Fence
Flag Poles
Folding Chairs
Folding Gates

PRODUCTS

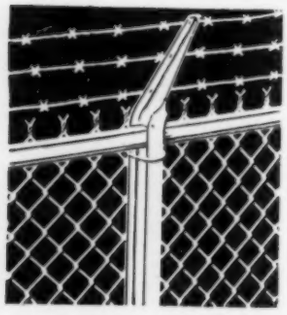
Iron Picket Fence
Pipe Railing
Settees
Stadium Seat Brackets
Window Guards—Wire Work

FOR EVERY PURPOSE

Stewart offers a complete line of Iron Picket and Chain Link Wire Fences and Gates to meet any school fence requirement whether it be for front or rear lines, athletic field or tennis court.

SALES AND ERECTION SERVICE

Stewart distributors in all principal cities together with competent erection crews, afford our customers a convenient and economical service.



View of Stewart Beam Line Post and Top Rail as Furnished with Style "3TH"

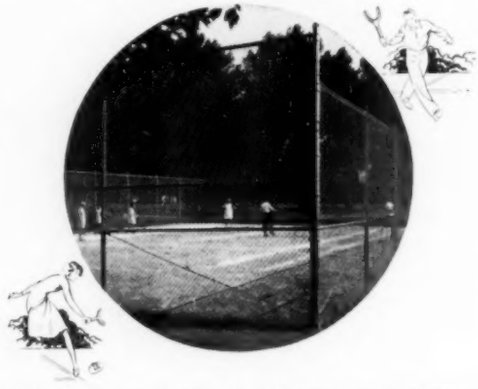
EXCLUSIVE FEATURES

Stewart Chain Link Wire Fences are distinguished by being the ONLY complete BEAM FRAMEWORK fence on the market. Long advocates of open-section Beam construction, since it is heavier and stronger than pipe, Stewart engineers have developed unique fabricating methods through its use. For example, the close-up view of Stewart Nonclimbable Fence (Style 3TH) depicts the Stewart Oval-Back I-Beam line post with integral extension arm; obviously superior to pipe or other types of posts requiring a separate pressed steel arm as so easily removed or broken. It will be noted that the beam top rail passes through the post itself—hence, the need for a fitting is obviated.

Standard heights of this style "3TH" are 7 ft. and 8 ft. overall. All materials are of Copper-Bearing Steel hot-dipped galvanized AFTER fabrication for maximum resistance to rust.

CATALOGS AND SPECIFICATIONS

In requesting literature, should your primary interest be in Chain Link Wire Fence, please ask for Catalog No. 75; if primarily interested in Iron Fence, ask for Catalog No. 76. Literature descriptive of other Stewart Specialties is available.



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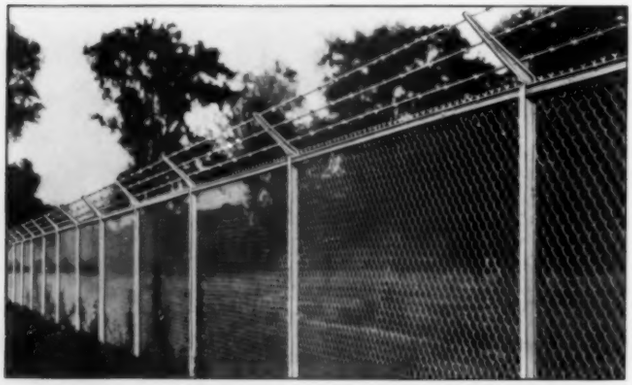

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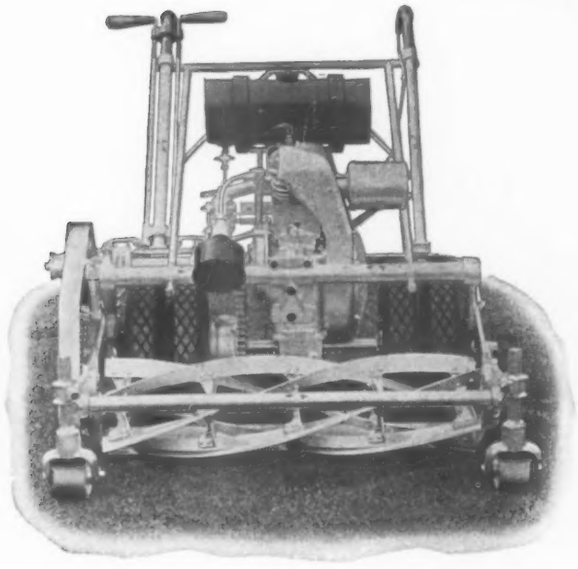

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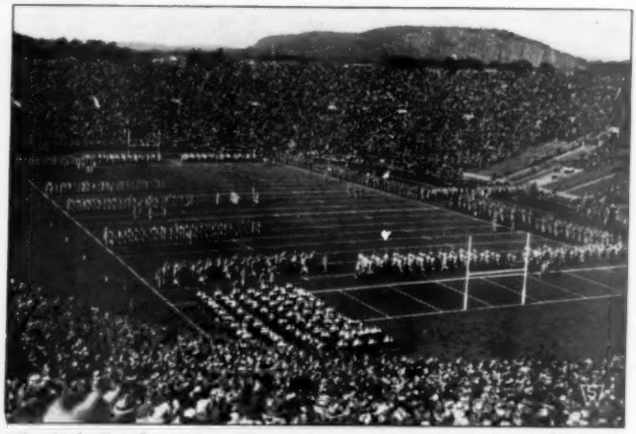

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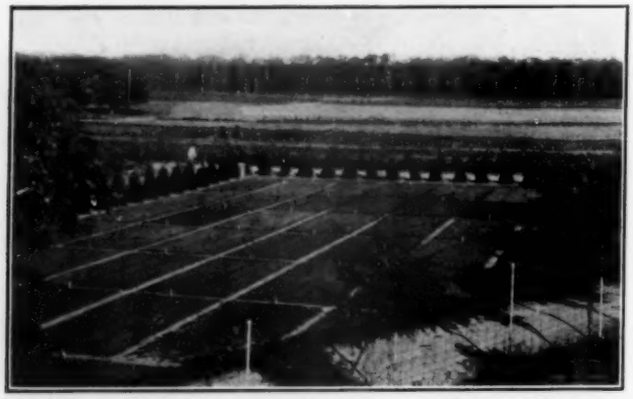

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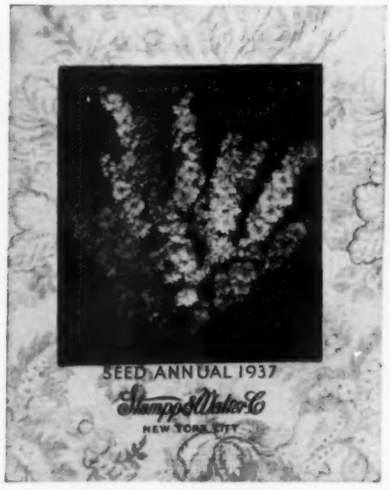

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SECTION V
PHYSICAL EDUCATION AND ATHLETICS

A SCORE CARD FOR MEASURING PHYSICAL EDUCATION FACILITIES

Criteria for Gymnasiums, Offices and Service Rooms

BY HERBERT BLAIR

Professor of School Administration,
Boston University

IN 1913, 7 states required that physical education be taught. Today 37 states, representing 90 per cent of the total population of the United States, have such requirements.

Several writers have pointed out that from 15 to 25 per cent of the cost of recent high school buildings has been due to the provisions for physical education and one need only mention the names of some of the various rooms (gymnasium, director's office, examination, corrective, locker, shower, drying, team, visiting team, rest, supply, apparatus, laundry) to show how complex the problem has become. That there is much difference of opinion among directors of physical education and specialists in schoolhouse planning regarding what should be included is only natural in a subject that has developed so rapidly.

In an attempt to measure the value of the physical education facilities in recent school buildings, sketches were made of what was provided in all the junior and senior high schools approved by the State Departments of Safety in Massachusetts, and of Education in New York, New Jersey, and Pennsylvania during a two-year period. Before these facilities could be scored, or rated, it was necessary to set up standards, or criteria, that would be generally recognized as valid by those who have attained leadership in this field.

Procedure in Making the Score Card

From the literature on standards for the physical education department * a brief description was made of what was considered to be the most desirable plan for (1) departmental offices, (2) gymnasium, (3) bleachers, (4) corrective room, (5) apparatus and seat storage, (6) service rooms (lockers, showers and sanitary), and (7) team rooms. Under each of these descriptions were several others, placed in what seemed to be a descending order of value, so far as one could judge from the literature on standards. In most cases the levels so given were brief descriptions of what was found in one or more of the buildings studied. This tentative score card was then sent to twenty state directors, an equal number of city directors, and thirty professors of physical education, and each was asked to determine the value he would give to each of the seven divisions on the basis of 1,000 points as the value of the entire group of facilities. The majority of those who replied wrote letters with constructive criticisms of the descriptions, or the arrangement of items, or of both descriptions and arrangements.

After the median value for each of the seven major divisions had been determined, the score card was sent a second time to the same group, with the request that a definite number of points (the median of the previous evaluation) be distributed among the several subdivision items. For example, the 350 points assigned to the gymnasium were to be so divided among the six items—(1) number of gymnasiums in relation to building enrolment, (2) location, (3) size, (4) window placement and the area, (5) nature of wall surface, and (6) type of floor—as to indicate how the scorer would weight each item for importance.

Again with the return of the score card, some of the accompanying letters criticized either the order of arrangement of the items, or the descriptions of the levels, as being ambiguous, or as over-emphasizing certain items. For example, the several levels describing the director's office appeared as follows on the first score card that was sent out:

* 1. American School and University Yearbooks, 1928-1934.
2. California State Department of Education Score Card for Evaluating Physical Education Programs. 1931.
3. Harrison and Dobbins: "School Buildings of Today and Tomorrow."
4. Hart, Frank: "A Standard State School Housing Code." 1924.
5. Nash, Jay B.: "The Administration of Physical Education." 1931.
6. National Educational Association Report of Committee on School House Planning. 1925.
7. Strayer and Engelhardt: "Standards for High School Buildings." 1924.
8. Williams and Brownell: Administration of Health and Physical Education. 1934.

1. Departmental Offices
   a. *First level*
      A small, well-lighted room, 10 feet by 12 feet, conveniently located for supervision of athletic field, gymnasium, and locker room. Equipped with private shower, toilet facilities and closet.
   b. *Second level*
      Same as (a) but so located as to permit view of but one activity.
   c. *Third level*
      Location inconvenient for the supervision of any activity but size and equipment as in (a).
   d. *Fourth level*
      Markedly larger, or smaller, than 10 by 12 feet without service equipment; inconvenient location.
   e. *Fifth level*
      Any place to put a desk without regard to the convenience or work of the physical director.

Some in criticizing the descriptions said that "location," which marks the difference between "level a," "level b," and "level c," is not important as compared to service facilities. Others wrote that the service facilities provided for the students should be used by the director. Others thought the director's office should be large enough to serve as an examination room, especially for the smaller buildings, and still others claimed that the amount of outside light needed more emphasis.

It was considered impractical to attempt an evaluation of the comparative merits of location, window area, service facilities, size, etc., so they were arbitrarily taken as of equal value, and the descriptions were rewritten as they appear in the score card accompanying this article.

In similar fashion the descriptions of the dressing rooms were rewritten, putting location, area per pupil in largest class, per cent of window area, and material used for walls and floors, as of equal value in determining the level at which the dressing room should be scored.

With the return of the score card for the third time, with a value given to each of the several levels, the card was completed.

Scoring the Physical Education Facilities of New High Schools

The illustrations accompanying this article indicate the wide variation in the facilities provided for physical education in the recently erected high schools of these four states.

It may be of interest to mention that while there were many buildings from which a selection could be made to illustrate the lower levels as described in the score card, there were few that illustrated the higher levels. No building was scored as at "level a" for bleachers and none at "level a" for locker rooms, or shower rooms, either for boys or for girls. The three buildings in New York with the highest score were rated at 760, 610, 545, each score being the average of four ratings. The three highest in Massachusetts were 585, 575, 575. The three highest in New Jersey were 580, 535, 510 and in Pennsylvania they came at 560, 530, 485. If the buildings in these four states can be taken as representative of what architects are now planning for the physical education program, either our standards may be considered as more ideal than practical, or our architects who plan school buildings are greatly in need of the services of an educational consultant.

The Score Card

I. DEPARTMENTAL OFFICES	110
1. Physical Director's Offices	60
(1) Boys' Activities	30
a. *First level.*—A small, well-lighted room about 10 x 12 feet, conveniently located for supervision of athletic field, gymnasium and locker room. Equipped with private shower, toilet facilities and closet	30
b. *Second level.*—Inferior to (a) either as to location or facilities, or size	25
c. *Third level.*—Inferior to (a) in two of these respects	20
d. *Fourth level.*—Inferior to (a) in three respects	10
e. *Fifth level.*—Any place to put a desk without regard to the convenience or work of the physical director	5
(2) Girls' Activities	30
a. *First level.*—A small, well-lighted room about 10 x 12 feet, conveniently located for supervision of athletic field, gymnasium and locker room. Equipped with private shower, toilet facilities and closet	30
b. *Second level.*—Inferior to (a) either as to location or facilities, or size	25
c. *Third level.*—Inferior to (a) in two of these respects	20
d. *Fourth level.*—Inferior to (a) in three respects	10
e. *Fifth level.*—Any place to put a desk without regard to the convenience or work of the physical director	5
2. Examination Room	50
(1) Boys' Activities	25
a. *First level.*—Size about 12 x 20 feet, in direct connection with the physical director's office and locker room. 20 per cent light	25
b. *Second level.*—Inferior to (a) either as to location, or size or light	20
c. *Third level.*—Inferior to (a) in two of these respects	15
d. *Fourth level.*—An enlarged, poorly lighted closet located without regard to the needs of the services or convenience of the director	5
e. *Fifth level.*—Any space large enough for a cot. No dressing room or service facilities	5

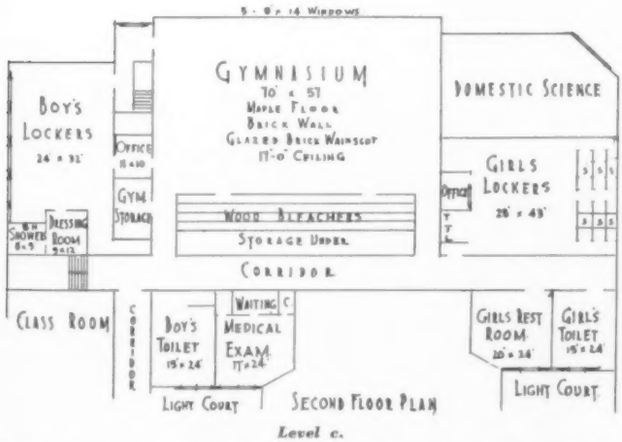
DEPARTMENTAL OFFICES—PHYSICAL DIRECTOR

Level a.

COST, $1,150,000. ENROLMENT, 1,000. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 60.

In this building, and in others planned by this firm of architects, the offices for the physical director are so located as to be in close touch with both the gymnasium and the locker room, with the outside window of the office overlooking the athletic field. Each office also has a closet and a private dressing room with shower. This is one of the few buildings that included a corrective room with the other facilities provided for the physical education program.

The score for the facilities as a whole is approximately 600. The building lacks examination rooms, has a single gymnasium lighted on one side and ends, has permanent rather than folding bleachers; small, inadequately lighted dressing rooms; too few showers and sanitary fixtures for the size of the class.

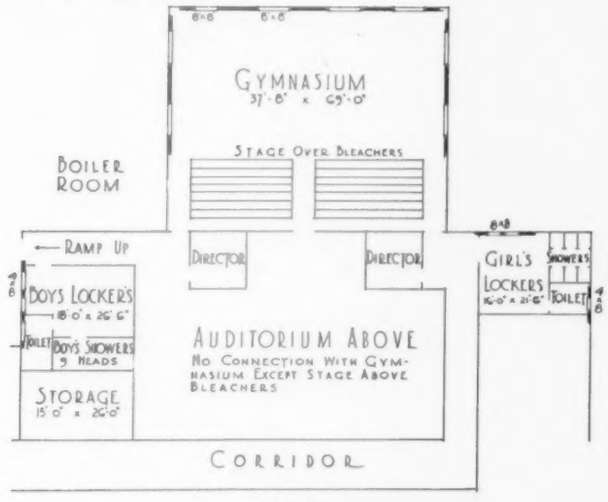


Level c.

COST, $400,000. ENROLMENT, 640. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 48.

In this building the offices are located adjoining both the gymnasium and the locker room, but have neither outside light nor separate shower. The score of approximately 450 is due to the location of the gymnasium, its poor lighting, the lack of a corrective room, and inadequate provision for dressing rooms and showers.

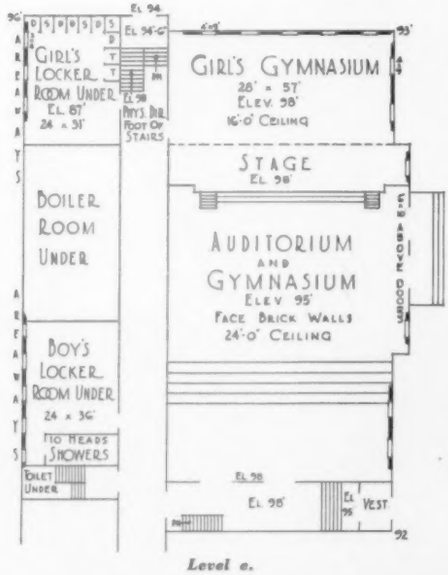
A good feature to be noted is the close connection between the physical education department and the rooms for the medical examination and the girls' rest room.



Level d.

COST, $350,000. ENROLMENT, 250. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 30.

In this building the offices are rooms 14 x 14 feet, without outside light or any special facilities, as shower, toilet or closet. Neither is so located as to oversee either the gymnasium or the locker room. The score of approximately 400 is lowered because of poor offices; lack of examination rooms or corrective room; inadequately lighted as well as too narrow a gymnasium; too small locker rooms with too few showers.



Level e.

COST, $190,000. ENROLMENT, 500. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 25.

The desk of the physical education director at the foot of the stairs is but one of the poor features of this plan. The girls' gymnasium is shorter, narrower and lower than the minimum sizes of 60 x 40 x 18 feet. The locker and shower rooms are located across a main corridor and downstairs from the gymnasium 7 feet below the outside grade level, with small windows from an areaway. Three showers for girls, compared to ten for boys, shows lack of educational planning.

(2) Girls' Activities 25
a. *First level.*—Size about 12 x 20 feet, in direct connection with the physical director's office and locker room. 20 per cent light.. 25
b. *Second level.*—Inferior to (a) either as to location, or size or light..... 20
c. *Third level.*—Inferior to (a) in two of these respects 15
d. *Fourth level.*—An enlarged, poorly lighted closet located without regard to the needs of the service, or convenience of the director 5
e. *Fifth level.*—Any space large enough for a cot. No dressing room or service facilities 5

II. GYMNASIUM FACILITIES 565
1. Gymnasium Rooms 350
(1) Number 85
a. *First level.*—Two gymnasiums for a total enrolment of not more than 700..... 85
b. *Second level.*—One gymnasium for each 500 pupils enrolled 70
c. *Third level.*—One gymnasium for each 700 pupils enrolled 60
d. *Fourth level.*—One gymnasium in schools enrolling less than 1,000 pupils..... 40
e. *Fifth level.*—One gymnasium in schools enrolling 1,000 or more pupils..... 25

(2) Location of Gymnasium 60
a. *First level.*—Ground floor at, or above, grade elevation; separate unit or wing; south exposure. At a point which permits of close correlation of work on athletic field with the use of the gymnasium..... 60
b. *Second level.*—Integral part of main building with one long side of gymnasium against some other part of the building, otherwise as in (a)..... 50
c. *Third level.*—So located that light is inadequate; either less than 20 per cent, or from skylights, or from ends rather than long axis 30
d. *Fourth level.*—Stage of the auditorium, or auditorium-gymnasium, or under auditorium. In any case, so located as to have at least 10 per cent of window area compared to floor area..... 20
e. *Fifth level.*—Hole in the ground. Under auditorium or classrooms; less than 10 per cent light 10

(3) Size and Height of Gymnasium..... 75
a. *First level.*—60 x 90 feet, with height of 22 to 24 feet under all beams and trestles.... 75
b. *Second level.*—50 x 80 feet, with height of 20 to 22 feet under all beams and trestles.. 65
c. *Third level.*—45 feet x 70 x 18 to 20 feet.. 50
d. *Fourth level.*—40 feet x 60 feet x 18 feet.. 30
e. *Fifth level.*—Narrower, shorter or lower than 40 x 60 x 18. The score for size and height should be reduced 2 points for each foot in width less than 40; 2 points for each foot in length less than 60; and 2 points for each foot in height less than 18.

(4) Light for Gymnasium..... 50
a. *First level.*—Two long sides of the gymnasium exposed to light and air. Window area over 25 per cent of floor area. No skylights 50
b. *Second level.*—20 per cent or more of window area, but from one long axis only..... 40
c. *Third level.*—20 per cent light, but from side and ends or overhead skylights..... 30
d. *Fourth level.*—Under 20 per cent window area, but over 10 per cent..... 20
e. *Fifth level.*—Less than 10 per cent window area 10

(5) Walls 25
a. *First level.*—"Anything you can walk on makes a good wall surface." Glazed brick or oak wainscot with soft brick or sound-absorbing plaster for the upper part of the wall 25
b. *Second level.*—Glazed brick or tile, or smooth face brick walls..... 20
c. *Third level.*—Common brick wall throughout, without wainscot..... 15
d. *Fourth level.*—Cement plaster wainscot with sand-finished plaster above..... 10
e. *Fifth level.*—Unsurfaced concrete block. Sliding doors 5

(6) Floors 55
a. *First level.*—Narrow width tongue-and-groove hard maple over diagonally laid hard pine on sleepers, with noise-reducing material between the two floors. Provision made on all walls and door openings for wide expansion joint to prevent buckling.. 55
b. *Second level.*—Wood blocks on end for upper floor, otherwise as in (a)..... 45
c. *Third level.*—Either maple strip or wood block with under floor, but without angle-iron covered expansion joint at wall..... 40
d. *Fourth level.*—Wood blocks on end laid directly upon concrete, without under floor on sleepers 30
e. *Fifth level.*—Mastic, or linoleum, laid directly upon the concrete..... 15

2. Bleacher Space 40
a. *First level.*—Seating arrangements for half or less of student body on lifting tiers of seats placed on the two long sides of the gymnasium 40
b. *Second level.*—Same as in (a), but removable bleachers to be placed on the floor when needed 30
c. *Third level.*—Permanent non-lifting bleachers starting at floor level for half the student body 20
d. *Fourth level.*—Galleries for spectators with front wall 8 or more feet above floor level 20
e. *Fifth level.*—Gallery or permanent bleacher area equal to or greater than playing area 10

3. Corrective Room 125
a. *First level.*—Approximately 25 x 50 feet; adequately lighted (at least 20 per cent), and located in direct connection with the examination room 125
b. *Second level.*—Approximately 20 to 30 feet, with adequate heat, light and ventilation; located as part of the physical education unit 100
c. *Third level.*—Regular classroom used jointly for health education and correction. Extra storage space for equipment..... 60
d. *Fourth level.*—End of main gymnasium fitted with stall bars, benches, plinths, mats, etc. 40
e. *Fifth level.*—Any odd-shaped, poorly lighted space, large enough for some corrective activities 20

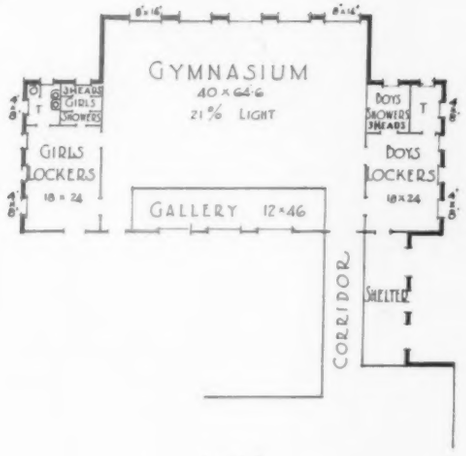
4. Apparatus and Storage Room 50
a. *First level.*—Adjoining each gymnasium on same floor level, with double door opening for piano, mats, apparatus. Approximately 200 square feet; outside windows. Separate provision for storing portable bleachers 50
b. *Second level.*—As in (a), except that bleachers are stored with apparatus..... 40
c. *Third level.*—Storage room located on different level from that of gymnasium floor, or separated from it by passageway or corridor 20
d. *Fourth level.*—Only storage space under overhanging gallery 15
e. *Fifth level.*—Room 10 x 10 feet or less. Too small for large apparatus or seat storage 5

GYMNASIUM—LIGHT

Level a.

COST, $675,000. ENROLMENT, 700. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 64.

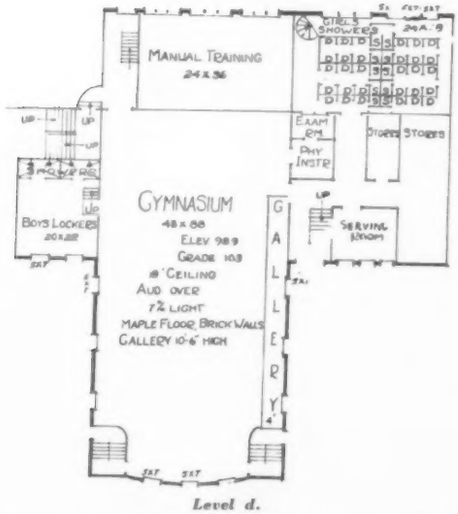
This building is one of the few of the 107 included in this study that had windows on the two long axes of the gymnasium. The score for the physical education facilities is reduced to approximately 425 because of the lack of examination and corrective rooms, a lack common to almost all these buildings, and also because of the narrow gymnasium, the location and size of the locker rooms, the small number of showers, eight for boys and four for girls, and few toilet fixtures in the locker and shower rooms.



Level b.

COST, $165,000. ENROLMENT, 90. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 26.

This building, by the same architect as Level a, has many of the same characteristics and scores somewhat higher, approximately 460, although costing less than one-fourth as much. The light is from the one long axis, but over 20 per cent of the floor area.

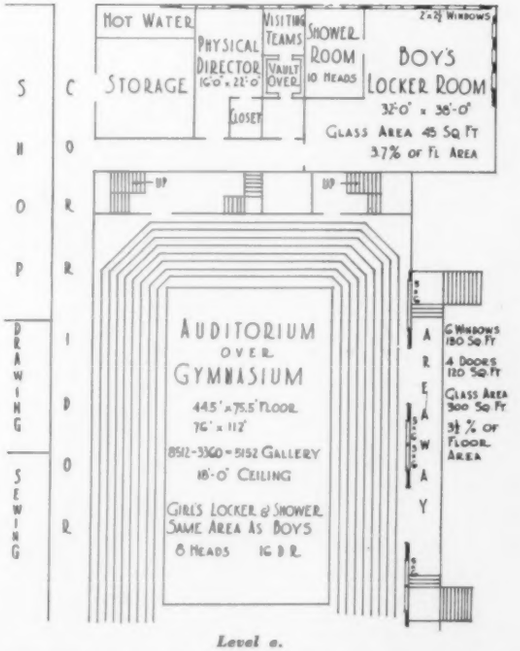

MANUAL TRAINING 24 × 36
GIRLS SHOWERS 24 A. 9
EXAM RM
PHY INSTR
STORES
STORES
GYMNASIUM 48 × 88 ELEV 98·9 GRADE 103 @ CEILING AUD OVER 7% LIGHT MAPLE FLOOR BRICK WALLS GALLERY 10·6" HIGH
BOYS LOCKERS 20 × 22
SERVING ROOM
GALLERY

Level d.

COST, $270,000. ENROLMENT, 334. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 35.

Although the windows are on the two long axes of the gymnasium, they are so located and so small that the window area is but 7 per cent of the floor area.

The facilities scored approximately 400 points. The location of the gymnasium and its lighting are at the e level, the shower rooms and bleacher space at the d level, with no items at the a level except that there is one gymnasium for an enrolment of less than 350 pupils.


HOT WATER
STORAGE
PHYSICAL DIRECTOR 10·0 × 22·0
VISITING TEAMS
VAULT OVER
CLOSET
SHOWER ROOM 10 HEADS
BOYS LOCKER ROOM 32·0 × 38·0
GLASS AREA 45 SQ FT 3.7% OF FL AREA
SCHOOL
UP
AUDITORIUM OVER GYMNASIUM
44.5' × 75.5' FLOOR 76' × 112' 8512 − 3360 = 5152 GALLERY 18'-0" CEILING
GIRLS LOCKER & SHOWER SAME AREA AS BOYS 8 HEADS 16 D.R.
DRAWING
SEWING
AREAWAY
6 WINDOWS 180 SQ FT
4 DOORS 120 SQ FT
GLASS AREA 300 SQ FT
3½ % OF FLOOR AREA

Level e.

COST, $400,000. ENROLMENT, 760. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 40.

The desire to provide for games and the team is very evident in this building. The bleacher area is a half larger than the playing area. The windows are but 3½ per cent of the floor and located on an areaway. The locker rooms for both boys and girls are poorly lighted. No item scored higher than level e, and three items, location, light and bleacher space, are on the lowest level. The total score is approximately 360.

III. SERVICE FACILITIES 325

1. Dressing Rooms 100

(1) Boys' Activities 50

a. *First level.*—Area of 20 square feet dressing and locker space per pupil for largest class; adjoining gymnasium; width not over twice the distance from the window top to the floor; 20 per cent window area; non-slip tile floor; brick or tile walls; readily accessible from athletic field..... 50

b. *Second level.*—Inferior to (a) either as to location or area per pupil, or light, or facilities 40

c. *Third level.*—Inferior to (a) in two respects 30

d. *Fourth level.*—Inferior to (a) in three respects 15

e. *Fifth level.*—Less than 10 square feet per pupil; less than 10 per cent window area; inconvenient location 5

(2) Girls' Activities 50

a. *First level.*—Area of 20 square feet dressing and locker space per pupil for largest class; adjoining gymnasium; width not over twice the distance from the window top to the floor; 20 per cent window area; non-slip tile floor; brick or tile walls; readily accessible from athletic field..... 50

b. *Second level.*—Inferior to (a) either as to location, or area per pupil, or light, or facilities 40

c. *Third level.*—Inferior to (a) in two respects 30

d. *Fourth level.*—Inferior to (a) in three respects 15

e. *Fifth level.*—Less than 10 square feet per pupil; less than 10 per cent window area; inconvenient location 5

2. Shower Rooms 100

(1) Boys' Activities 50

a. *First level.*—Adjacent to locker room, easy of access from gymnasium, swimming pool and athletic field, separate from but adjoining locker room through a drying room; 14 square feet of floor area for each shower-head. One shoulder-height shower for each four boys in largest class. Non-slip tile floor and marble or tile walls. 20 per cent window area, copper-covered frame and sash 50

b. *Second level.*—Inferior to (a) either as to location, or size, or number of showers, or light, or drying room..... 40

c. Inferior to (a) in two respects..... 25

d. Inferior to (a) in three respects 15

e. Inferior to (a) in four respects..... 5

(2) Girls' Activities 50

a. *First level.*—Easy of access from gymnasium, swimming pool and athletic field. Separate dressing booth and shower for each girl in the largest class. Shoulder-high showers arranged in rows under control of instructor with exhaust hoods above each double row of showers. Non-slip tile floors, marble partition walls. 20 per cent window area, copper-covered frame and sash. Adequate heat, ventilation and drainage..... 50

b. *Second level.*—Arranged as in (a), except that one shower is placed between each two dressing rooms 40

c. *Third level.*—Same arrangement as first level for boys..... 40

d. *Fourth level.*—Three or four dressing rooms for each shower-head. A minimum of one shower for each six girls in largest class. Convenience of use, area per pupil, percentage of light, or sanitation sacrificed through economy or poor planning..... 20

e. *Fifth level.*—More than six girls for each shower 10

3. Team Room 25

(1) Boys' Activities 20

a. *First level.*—Space in main locker room for a sufficient number of large lockers so that the equipment issued to team members is safeguarded 20

b. *Second level.*—One or two special dressing rooms of about 200 square feet area, located near the entrance and convenient to the showers, for the boys' visiting team or home team or both, equipped with benches and hooks or lockers..... 15

c. *Third level.*—Same floor area set apart for the teams as for the rest of the school. Two separate rooms as part of the physical education facilities, equipped with lockers, showers and toilet facilities. One each for boys' home team and boys' visiting team 10

(2) Girls' Activities 5

a. *First level.*—Space in main locker room for a sufficient number of large lockers, so that the equipment issued to team members is safeguarded 5

b. *Second level.*—Two special dressing rooms of 200 square feet area, located near the entrance and convenient to the showers for the girls' visiting team, and home teams, each equipped with benches and hooks or lockers 3

c. *Third level.*—Same floor area set apart for the teams as for the rest of the school. Two separate rooms as part of the physical education facilities, equipped with lockers, showers and toilet facilities. One each for girls' home team and girls' visiting team.. 0

4. Sanitary Features 50

a. *First level.*—Entrance to toilet room from shower as well as locker room. Outside light, tile floors and walls. One toilet for each 15 girls in largest class. One toilet and one urinal for each 25 boys in largest class. One lavatory for each 20 boys or girls 50

b. *Second level.*—Toilet room connected with locker room or shower room, but not with both. Otherwise as in (a)..... 40

c. *Third level.*—As in (b), but one toilet for each 25 girls and one urinal for each 50 boys 30

d. *Fourth level.*—One toilet and one lavatory, irrespective of size of class..... 10

e. *Fifth level.*—Toilet room of school not directly connected with service unit..... 5

5. Towel and Suit Facilities 30

a. *First level.*—Small room adjoining both dressing room and shower room, from which clean towels and freshly laundered gymnasium or swimming suits may be served to users for each physical education period 30

b. *Second level.*—Smaller room for towels located as part of the physical education unit 20

c. *Third level.*—Storage closet for towels (frequently adjoining the school laundry), not part of the physical education unit..... 10

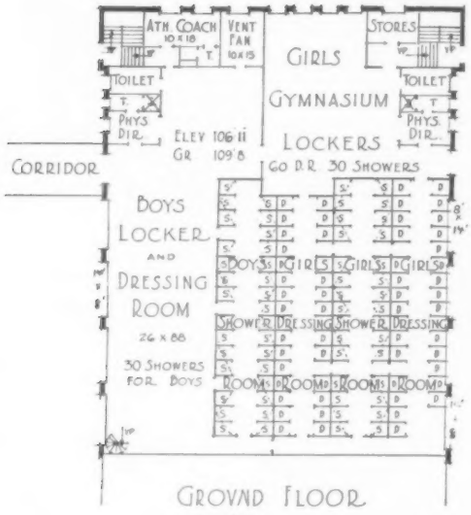
6. Drying Room for Athletic Clothing 20

a. *First level.*—A room adjoining each locker room large enough to hold drying racks for a day's allotment of clothing for either football or outdoor hockey. Over-size exhaust ducts and extra radiation to provide rapid drying of clothing and elimination of odors 20

b. *Second level.*—One room for football clothing, equipped as in (a)..... 10

c. *Third level.*—Storage space in connection with the physical education department where extra-size lockers for football clothing may be placed..... 5

SHOWER FACILITIES—GIRLS' SHOWER ROOM

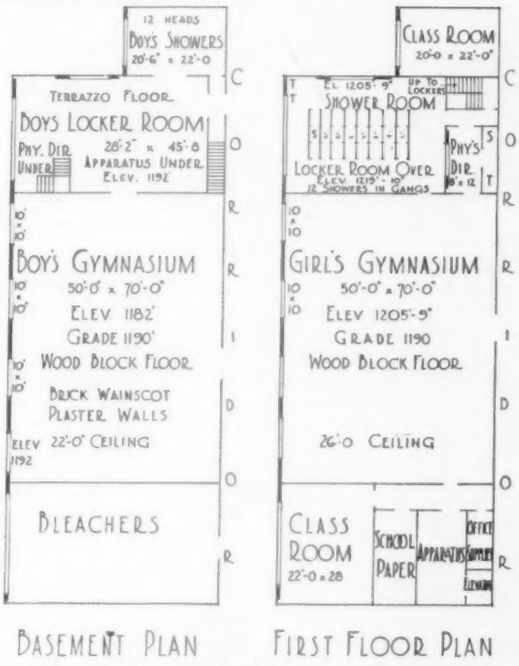


Level b_1.

COST, $1,225,000. ENROLMENT, 3,025. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 90.

This building has the largest number of showers, 30, of any included in this study, and the gymnasium above (not shown) has the largest ratio between window area and floor space, 30 per cent. The score for the facilities as a whole is approximately 575.

At level a or b are the offices for the directors; the location, size, light, walls, floor, bleacher space and storage for the gymnasium; the locker rooms and sanitary facilities. The only rating at the d or e level was because only one gymnasium is provided for such a large school enrolment.



Level b_2.

COST, $800,000. ENROLMENT, 2,242. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 55.

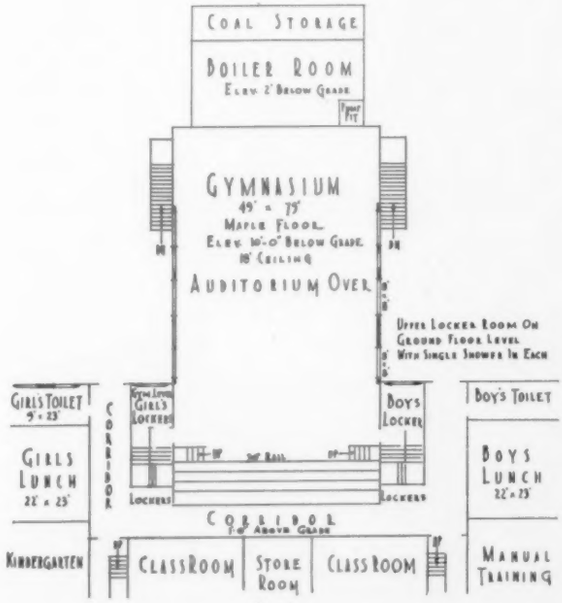
This building, by the same architect as level b_1, at left, has an entirely different arrangement of showers. Eight showers are so placed that each has two dressing rooms, and twelve are placed along the wall without dressing rooms or partitions between the showers. The total score for the physical education facilities is approximately 480. The offices, storage facilities, dressing and shower rooms are at level b. The window area of the gymnasium is but 11 per cent of the floor area, in contrast to 30 per cent that this architect provided the building shown at the left (level b_1).

Level d.

COST, $350,000. ENROLMENT, 650. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 50.

The low score for this shower room is largely due to the small amount of window area, 5 per cent, and the small number of showers, 6, for a class of 50.

The score for the total facilities is approximately 400. Most of the items come at the e level. The location of the gymnasium and its concrete walls and the inadequate shower rooms for both boys and girls, are the poorest features.

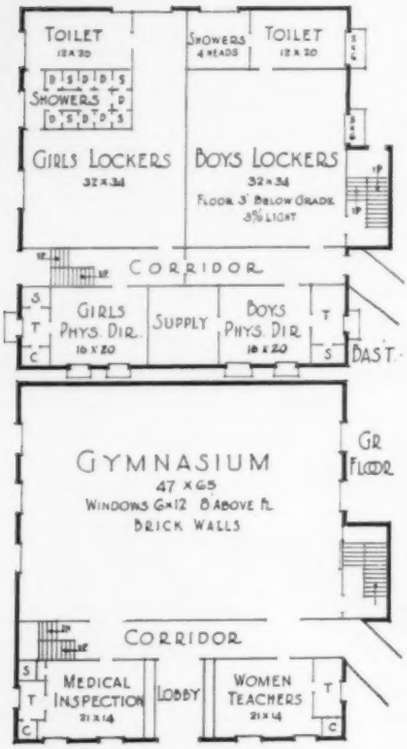


Level e.

COST, $212,000. ENROLMENT, 90. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 30.

This building, scoring approximately 235, received a lower rating than any other in its state. The single shower for boys as well as for girls, the gymnasium floor 10 feet below grade level, the small window area of the gymnasium, the divided locker facilities on two floors, with each little more than a stair landing, the lack of storage space, toilet facilities, and departmental offices, are what give the building such a low score.

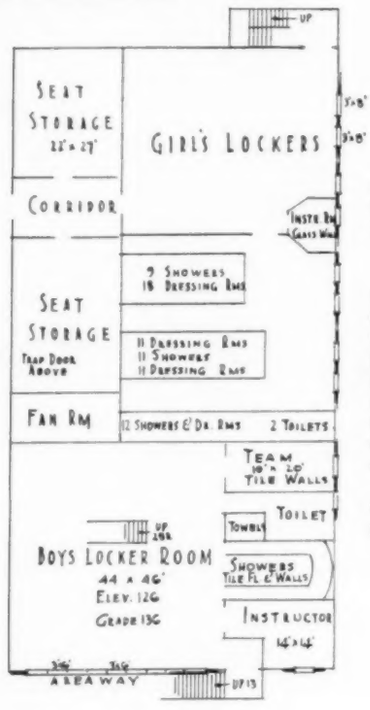
SERVICE FACILITIES—SANITARY FEATURES



Level a.

COST, $336,000. ENROLMENT, 560. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 50.

Entrance to the toilet room from both the locker room and the shower room is considered a desirable administrative feature. It was, however, quite generally overlooked in planning the sanitary arrangements in this group of buildings. No other item in this building was placed at level a. The shower rooms for both boys and girls are at the e level. The location of the rooms for medical inspection and women teachers adjoining the physical education department provides examination rooms. The approximate score for the total facilities is 410.

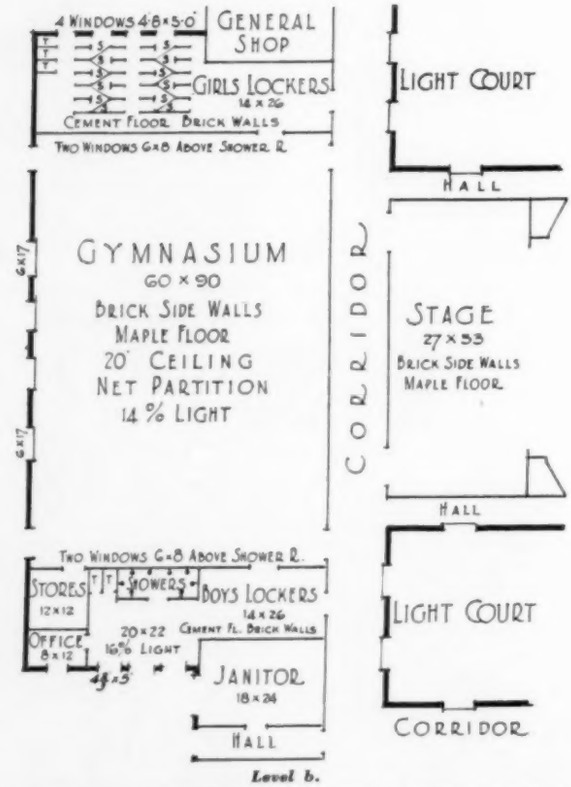


Level c.

COST, $950,000. ENROLMENT, 1,800. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 70.

The gymnasium of this building was used as an illustration for level b bleachers. This illustration of the floor below the gymnasium shows the amount of space given to seat storage. There are 26 showers for girls, with 52 dressing rooms, and 20 showers for boys.

Most of the items received the c level rating. The approximate score is 485.

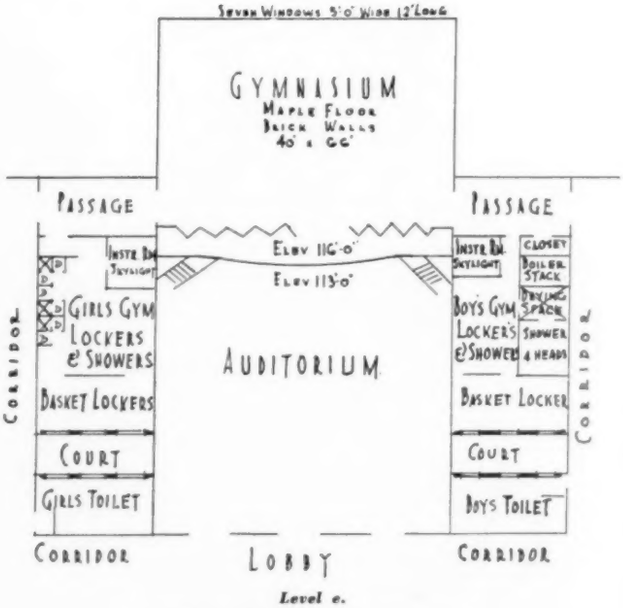


Level b.

COST, $416,000. ENROLMENT, 1,170. SIZE OF LARGEST PHYSICAL EDUCATION CLASS, 51.

The size and height of the gymnasium and space for portable bleachers are the only items except the provision for sanitary features that are as high as level b.

The inadequate provision for departmental offices, only one gymnasium for over 1,100 pupils, with few windows, the small dressing room for girls and poorly located shower room for boys are at the d or e level. The approximate score for the total facilities in this building is 370.



Level e.

COST, $250,000. ENROLMENT, 530.

The only feature of this building that was given the level b rating was having a gymnasium for an enrolment of 530. The d, e and zero ratings were many. The location, size and light for the gymnasium; the dressing and shower rooms for both boys and girls; the lack of sanitary features in the locker rooms, and storage space for the gymnasium, all helped to lower the approximate score to 270. The illustration shows clearly the distance from the locker rooms to the building toilet rooms.

OUTDOOR AREAS AND FACILITIES FOR PHYSICAL EDUCATION—THEIR PLANNING AND MAINTENANCE

BY SAMUEL A. COOK AND CECIL F. MARTIN

Superintendent of Buildings and Grounds, and Director of Physical Education, respectively, Pasadena City Schools, Pasadena, Calif.

THE playgrounds in the Pasadena school system compare favorably with those in other parts of the country. The satisfaction attained has been reached only by careful initial planning of new areas, the replanning of unsatisfactory sites, and continuous maintenance by a well-organized group.

Organized Planning of Play Areas in Pasadena

Pasadena schools are organized on the Kindergarten 6-4-4 plan, housing 21,000 students in 23 elementary schools, 5 Junior High Schools, a Senior High School, and a Junior College. Playgrounds must be provided, therefore, for all ages from the youngest to the youth of twenty. Additional use of the play areas by adults and children in out-of-school hours is provided under the auspices of the Department of Recreation, an organization controlled jointly by the Pasadena School District and the city of Pasadena. The Director of Physical Education for the schools is also the head of the Department of Recreation.

The Director of Physical Education, and the Superintendent of Buildings and Grounds, together plan, and direct the development of play areas, athletic fields, courts, and equipment. They confer with the principal, who is the ranking administrative line officer in charge of each school unit. Because of the unit plan of organization, educator, architect and engineers have pooled their efforts to meet needs and minimum costs and provide utility and safety.

The Essentials of Playground Planning

It is just as essential from the standpoint of utility, operation, and maintenance that the school playground be properly planned as it is that the school building be planned. No play area should be developed until its planning has been completed. Planning will conserve space, accommodate drainage, contribute to attractiveness, minimize costs of installations and maintenance, provide organization, accommodate more services, provide for safety, and avoid noises, glare, disturbing winds and many other undesirable factors. Proper planning will assure flexibility to meet changing needs and expansions, alternate uses, peak loads, movement of groups, shade and shelter, sanitation, beauty, and economies in time and finances.

Unfortunately, it is frequently found in many districts that in the initial stages of planning for a school unit little thought is given to the matter of physical education and recreation facilities. However, the size, shape and topography of grounds, together with surfaces and drainage, are of paramount importance for a successful layout. The initial capital outlay expenses are often more than overbalanced by necessary grading and maintenance costs, even before grounds are usable.

One of the principal considerations to be acccorded school grounds is adequacy of size. In Pasadena it has been found that five acres are in general most desirable for an elementary school and from ten to fourteen acres for a junior high school. The Pasadena Junior College site comprises a total of forty acres.

A rectangular piece of land lends itself best to planning outdoor facilities. A site having been selected which measures up to the various criteria governing site selection, the development of the plot plan is next in order. A complete topographic survey is indispensable. Such a survey will indicate boundary lines, all existing physical features of the property, and the elevation contours. The contours should be determined at intervals not exceeding one foot. The placement of the building is given next consideration, keeping in mind orientation, the relation of building lines to street and property lines, and also to playground area. Where more than one building is contemplated, the proper relation of each building to the others and the campus as a whole must be determined. Consideration of the ultimate future development of the school should constantly be kept in mind.

The "topographic" plot plan furnishes an indispensable means for the study of the required grading of the grounds. Such studies are influenced by several factors. If possible, the amounts of "cut" or excavated earth materials should balance the amount of "fill." This is dictated by economy in order to avoid the necessity for either hauling away excess earth or hauling in "borrowed" fill. The grading should be

designed so that the necessity for the construction of retaining walls will be reduced to a minimum. Limiting grades should be determined for all play areas in order that the play activities may not be hampered. The maximum grade for an elementary school playground might be established at 3 per cent, but such a grade would not be permissible for a running track or football field. The grades for a tennis court, moreover, should be only sufficient to drain rainwater from the surface. In other words, the grade of the grounds should be suitable for the activities provided.

Again, studies of the grading will determine what major provisions must be made for intercepting the storm water run-off. The character of the soil, the kind of surfacing, whether or not the grounds will be paved, and the intensity and duration of heavy rains, are all factors which affect the proper planning of the drainage system.

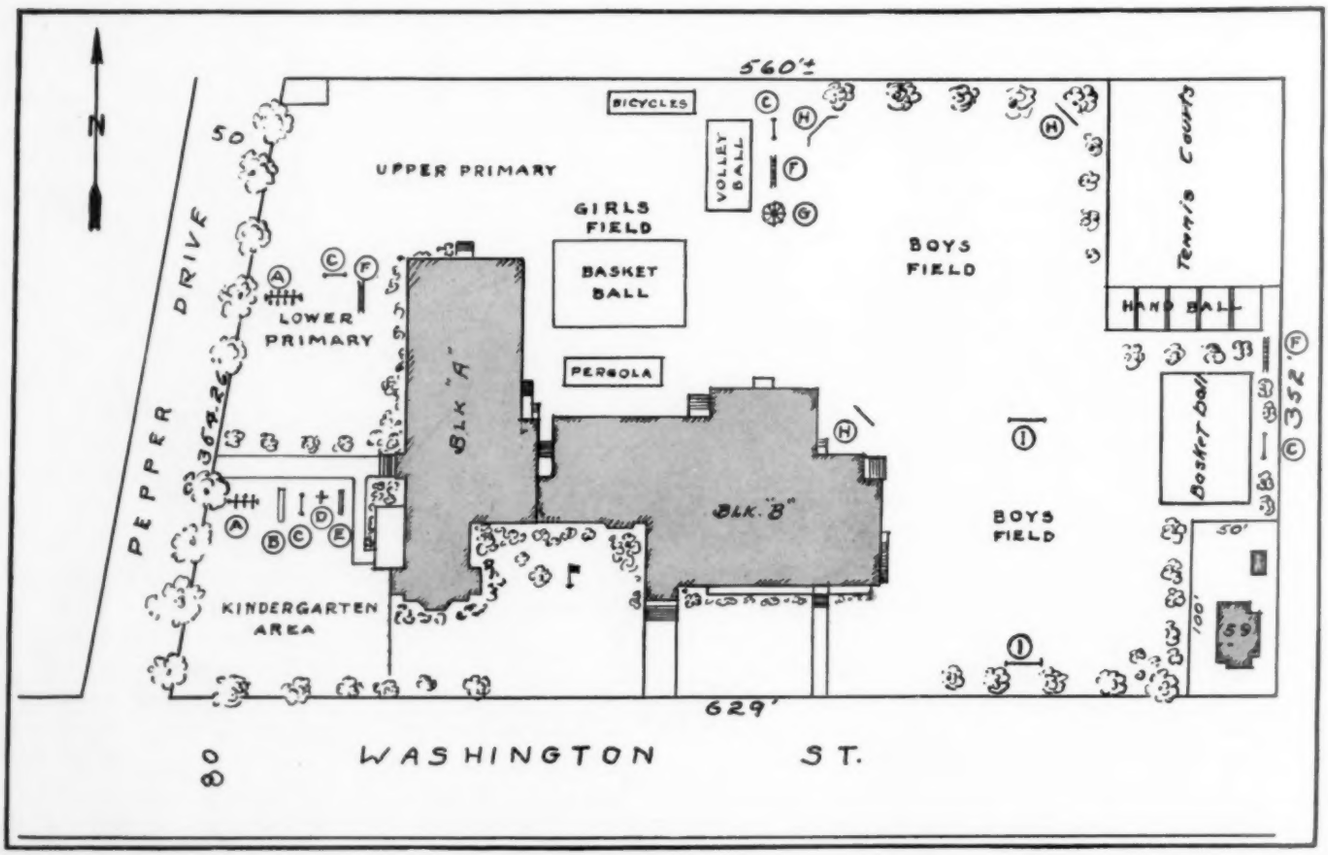
Before the plot plan can be considered complete, the play areas and their use should be marked, proposed fencing should be shown, apparatus "spotted," and lawns, shrubbery and tree locations indicated.

Arrangement of Apparatus

Location and placement of apparatus involve accessibility, maximum utility, safety, valuable developmental effects, and pleasurable and stimulating outcomes. Apparatus should be installed away from buildings, windows, pergolas, trees, backstops, traffic lanes and other obstruction hazards, and when possible in a straight line.

As the tendency of children is to experiment, the apparatus should be so arranged as to contribute a sequence of experiences, namely, climbing, traveling, twisting, pumping, sliding, hanging, swinging, turning, vaulting, jumping, etc. Such variation will distribute muscle load and foster all-around development.

Orientation of play areas with relation to the sun's path must be given consideration. Out-of-door basketball, volleyball, tennis, badminton, handball, speedball courts, soccer and football fields should be arranged with their major axes running north and south. Preferably in order, baseball and playground baseball diamonds should be arranged with the home



A Typical Elementary Plot Plan

A— Swings
B— Slide
C— Horizontal bar
D— Climbing tree
E— Rockabye
F— Horizontal ladder
G— Flying rings
H— Baseball backstop
I— Soccer goal

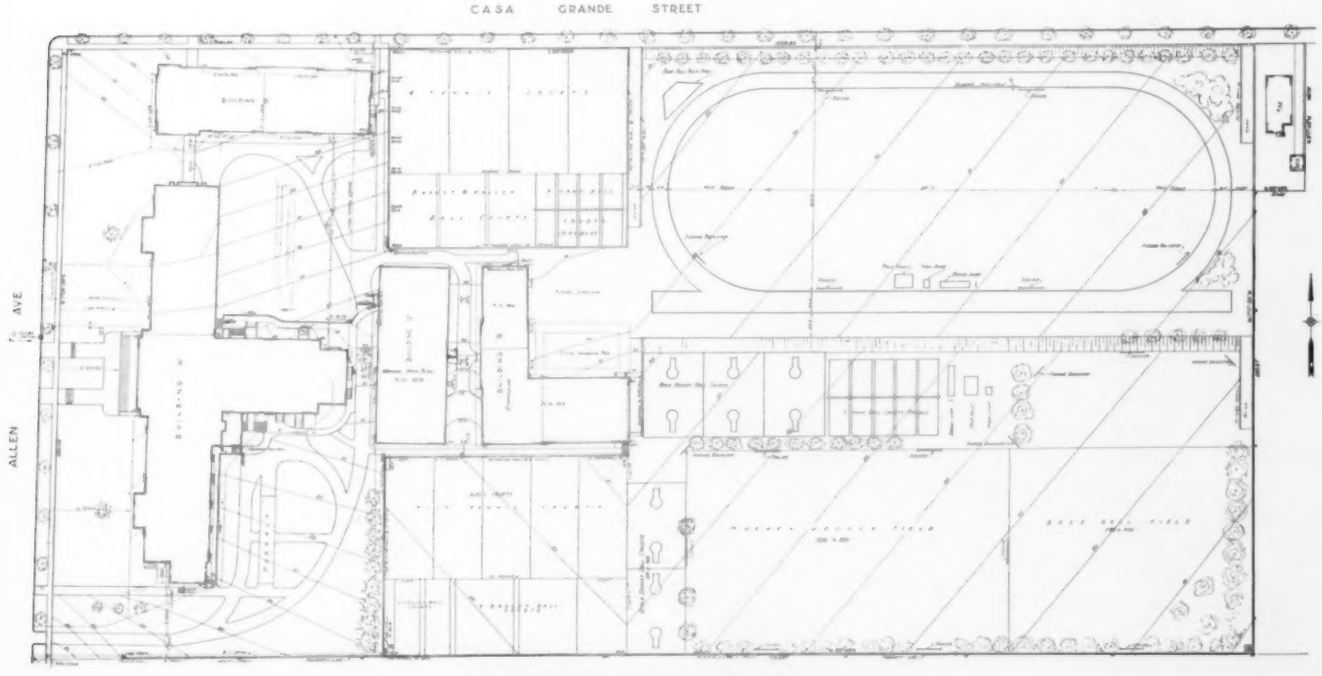
Kindergarten Playground Equipment

plate in (1) the northwest corner, (2) the northeast corner, (3) the southwest corner.

Layouts of Grounds

Each school site presents its own different problems, and ideal situations cannot always be realized. However, it is well to adopt layouts which can be used as objectives. In the Pasadena system, such layouts have been prepared both for the elementary and the secondary schools. The typical layout for the elementary schools provides segregated play areas for children in the various group levels, one for the kindergartners, one for the younger primary children, one for the upper primary boys, one for the upper primary girls, and a separate play field each for boys and girls in grades 4 to 6. The area for each group is closely adjacent to the classrooms used by the group. The older boys' and girls' areas are properly related to boys' and girls' toilet facilities within the building. With such an arrangement, there is no interference between the play activities of any of the groups of pupils.

Each of these portions of the grounds is provided with an open, unobstructed play area ranging from 50 x 50 feet square for the kindergartens to large areas for soccer and baseball in the older children's fields. Each group is provided with its own play apparatus, so placed as not to interfere with games in the open areas. The fields for older pupils are equipped also with handball and volleyball courts, one or more



A Typical Layout for Junior High School Use

The Apparatus Should Be Arranged to Contribute a Sequence of Experience (Elementary School, Boys' and Girls' Playground Equipment)

tennis courts, basketball goals, and playground baseball backstops. In addition, each playground has a shed for the protection of bicycles, and a pergola for shade and eating lunches.

In the secondary schools in Pasadena, the play areas for boys and girls are divided. The standard plan provides a battery of tennis, volleyball, basketball and handball courts for boys, and a duplicate set for girls. The girls' area calls for a combined hockey, soccer and track field, and a field for playground baseball. A quarter-mile track enclosing a football and baseball field is indicated for each of the boys' areas. Backstops have been constructed for hard baseball. Facilities are also provided for vaulting and jumping pits. Horizontal bars, high jump and vaulting pits are filled with sawdust, and pits for the running broad jump are filled with sand. A sump hole in the pits filled with coarse gravel aids proper drainage.

Prevention of Accidents

The major consideration accorded the development of playgrounds is the safety and health of the children. These factors are constantly kept in mind, whether it be in the purchase of equipment or the improvement of the grounds themselves. A summary is kept of all accidents occuring on play fields, which has acted as a guide toward the elimination of unsafe types of equipment, and the improvement of situations which were contributory to accidents. A rigid inspection is made each month of every piece of physical education apparatus in the gymnasiums or on the play fields. Repairs are made immediately.

A report of these inspections is made to the central office. The report is signed by the "playground mechanic" who makes the inspection, and countersigned by the principal of the school. Through this method of control we have not had an accident due to faulty equipment since the inspection was started. At the final inspection of the year, all equipment showing need is painted. This overcomes the tendency of

The Fields for Older Pupils Are Equipped with Playgrounds (Elementary School, Boys' Playgrounds)

badly weathered wood members to sliver, and prevents the rusting of metal parts.

In general, iron posts are used in preference to wood, thus overcoming the tendency to rot. When installing equipment, upright posts are firmly planted in concrete. The height of the apparatus is adapted to the group level of the children using the equipment.

Elementary Play Areas Are Surfaced with Asphaltic Macadam or with Premixed Asphaltic Concrete

Surfacing Play Areas

The question of the type of surfacing to be applied to a school ground is much mooted. Elementary play areas in the Pasadena schools are surfaced largely either with an asphaltic macadam or a premixed asphaltic concrete. It has been found that the premixed asphalt with an aggregate not exceeding ⅜-inch in size forms the most satisfactory surface. In planning the installation of a pavement, particular attention must be given the subgrade, for the life of any pavement is influenced by the subgrade provided. Pasadena is situated in the foothills of the adjacent mountains, and frequently the slopes of playgrounds are close to the maximum permissible grade. Rains

in the winter are heavy and there is a considerable tendency towards soil erosion. Where grounds are paved, the erosion is eliminated entirely. Paved grounds are free from dust. Accident reports indicate very few cases of scraped skin or burns where children fall on the grounds. Much of this paving has been installed during the past ten to twelve years, and during that time maintenance costs have been exceedingly small. At each of his monthly visits, the "playground mechanic" inspects the paved areas, and defective places are reported and repaired.

The type of paving used is relatively inexpensive, costs ranging from 3 to 4 cents a square foot. Other dust palliatives have been tried, but the necessity for their repeated application provides a pyramiding cost which exceeds the initial paving cost. Among other advantages of paved areas is the freedom from weeds. The benefits of paved areas are also reflected in the

Baseball, Soccer, Football, Track, Field Sports (Senior High School, Boys' Field)

amount of maintenance work required by the custodian in the school building itself.

At the high schools, practically all the boys' athletic fields inside the running tracks have been turfed, and at a number of the schools grass has been sown on the girls' hockey fields. Asphaltic paving has been used at the high schools, only in conjunction with the tennis and outdoor basketball and volleyball courts. The turfs are sown with a mixture of Bermuda and Irish rye. Turfed areas are mown weekly and are fertilized and reseeded annually. The reseeding, of course, is limited to areas where there are signs of wear. Sprinkling systems have been installed on all the athletic fields, and during the dry weather the grass is watered on alternate days. Turfed athletic fields have much to commend them, not only because they are ideal play surfaces, but also because they greatly improve the appearance of the school grounds. The esthetic value of public buildings and their grounds to the community must not be overlooked. Turfed athletic fields are highly valued from the standpoint of improved health and safety conditions. It has also been found that the wear and tear on athletic equipment is minimized where areas are grassed.

In the High Schools, Boys' Athletic Fields Are Turfed

A portion of the school site should, of course, be reserved for planting and lawns. Sprinkling systems are valuable additions when lawns are installed, since it has been found that the cost of the sprinkling system is far less than the cost of watering by hand over a period of time.

Landscaping the Playgrounds

Beautification, shade and shelter are possibly among the most neglected conditions of many playground areas. Pergolas, arcades, shelter sheds, trees and shrubbery, properly placed, add to beauty, protect from prevailing winds, and avoid glare and serve comfort and relaxation. No center is complete or satisfying unless these elements are part of the general plan.

At the time of the preparation of the layout of the playgrounds the landscaping of the rest of the grounds should also be indicated on the same plan. Shrubbery is then planted in accordance with these prearranged details. Native varieties should be used so far as possible. A nursery has been developed in the Pasa-

The Standard Plan Provides Tennis, Volleyball, Basketball and Handball Courts for Secondary Pupils

dena schools for the propagation of shrubbery, and planting costs have thereby been greatly reduced. In developing the landscaping plans for a school site, existing trees are reserved where they cause no interference with the use of the premises. Additional trees and shrubbery are planted in play areas and athletic fields in locations where they will not be sources of danger to the players. Trees, especially in California, are desirable for shade and add largely to the appearance of the grounds. Extensive use of extremely formal plantings and the planting of flowers is avoided as much as possible on account of the cost of care involved.

Responsibility for Yard Duties

In the Pasadena system, gardeners are divided into "traveling crews." The amount of gardening care allotted to each school will vary from one-half day a week at the smaller schools to as much as two or three days a week at the larger plants. At only two schools are gardeners employed for full time. The mowing of lawns and athletic field turfs in general is done by power mowers whose operators travel from one school to another. Spraying for pest and insect control is also performed by the traveling group through the use of a power-operated spray machine.

Weed control is another function of the gardening department. A water cart is used for watering trees and shrubs on the playgrounds and the athletic fields. This care is given to younger trees not less than once each month during the dry season. The gardeners are also held responsible for the condition of the yard drainage systems. They are required to keep all catch-basins free from leaves and other débris in order that the drains may not be plugged when the winter rains descend.

It is the policy in the Pasadena schools to enclose all play areas with fencing where possible. In general, the fencing is constructed with a galvanized after-weaving chain-link fabric with iron posts and rails. The use of barbed wire at the top of fences is prohibited. In general, fences on street lines are constructed 6 feet high, and on dividing property lines 8 feet high. Higher fences are installed where the need arises, and particularly around tennis courts, where a height of 12 feet is used. Fences not only offer safety to the children by preventing them from running out into traffic lanes, but also afford a major protection to the property itself and, moreover, keep out night prowlers. Fences are inspected monthly at the same time as the playground equipment.

It will be noted that the custodian in the Pasadena school is not responsible for many yard duties. Custodians and gardeners are assigned definite work-time schedules. Repair work on the playground is performed by maintenance men. The custodian schedule at each of the schools provides for the policing of play areas once each day immediately after the noonday lunch period. All papers, fruit skins, and other débris are picked up at that time. Each play area is provided with an adequate number of drinking fountains, which are cleaned twice daily.

Plans have been made in the Pasadena school districts for the complete future playground development at each school site. So far as possible, some improvement is made each year on those grounds which are not in conformity with the adopted layouts, and eventually the ideal developments will be realized.

THE NEW ATHLETIC BUILDING AT THE UNIVERSITY OF MINNESOTA

BY LOUIS F. KELLER

Associate Professor of Physical Education,
University of Minnesota

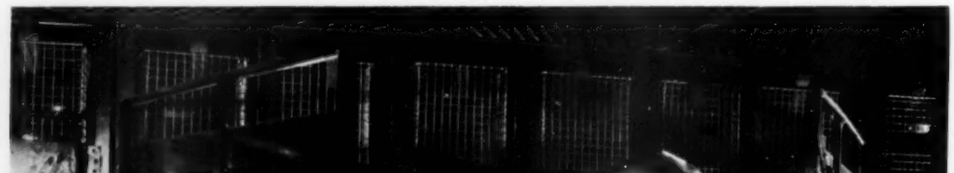
THE new Athletic Building, or, as it is often called, the Indoor Sports Building for Men, at the University of Minnesota, which was ready for occupancy on January 1, 1935, has fulfilled several long-felt needs of the Department of Physical Education and Athletics. The Stadium, with its underneath equipment for handball, squash racquets, orthopedics, boxing, wrestling and other activities, and the Field House, with its indoor facilities for basketball, track, football, tennis, and baseball, adequately provided for intercollegiate sports of this nature, but there was relatively meager provision for department offices, intramural athletic activities, swimming, gymnastics and the general class physical education program. It was with these needs in mind that the new Athletic Building was planned. The architect was C. H. Johnston, of St. Paul.

The building is located at the open end of the Stadium, and architecturally furnishes a welcome addition to that unit. A spacious tunnel connects the new building with both the Stadium and the Field House, making the entire group readily accessible in inclement weather—a desirable feature in a northern climate. It makes possible a concentration of locker and equipment facilities for all sports and does away with wasteful duplication coincident with unconnected buildings.

The Athletic Building is a four-story structure with what amounts to two additional floors underground. It is practically fireproof throughout, being constructed mostly of steel, concrete and brick. The walls are face brick, of a kind and color to match the other two units of the athletic group, backed by brick and tile. The partitions are plastered tile, the staircases, window-frames and sashes are steel, and the floors are reinforced concrete. The floor coverings in the offices, corridors and classrooms are mastic tile, while that of the gymnasiums is hard maple.

The shape of the original building is practically rectangular, with over-all length of 234 feet and a width of 120. To this has been added during the past year a terrace addition in front, connected to the sub-basement, increasing the basement width approximately 30 feet. The architects effectively emphasized economy of space in their planning and yet designed a building that is artistic and pleasing and at the same time well fitted for the many and varied purposes which it is called upon to serve.

The general arrangement of the building is not unlike that of most structures of its type. The underground floors are mainly devoted to service facilities, although two swimming pools are included in this space. The first floor houses the offices of the department director and also has spacious accommodations for the athletic ticket sales department. The second floor is taken up by offices of the staff members, classrooms, library, study and conference rooms. The third floor is devoted almost entirely to gymnasiums, and the fourth, which is really a balcony floor, is a relatively small space originally intended for storage but at the present time used as a ping pong room.



Basket Lockers System

Locker-Shower and Supply Rooms

The locker, shower, and supply rooms for practically all the activities, intercollegiate, intramural and class, are concentrated in the basement of this one building, those for the class and intramural activities under the main part of the building; 1,900 basket lockers, arranged on the post office box plan and serviced from the inside, provide for these groups. A unique signal system shows the attendant that the basket has been removed and therefore needs to be re-serviced.

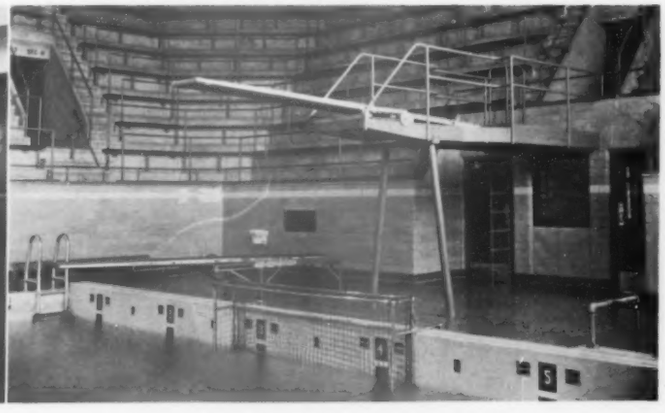
Adjacent to this locker room are two shower rooms, one with an entrance to the recreation pool and the other with an opening to the exhibition pool. The showers are the overhead type, connected in sets of six, each unit having an outside thermostatic control as well as single controls at the separate showers. The walls are tan-colored glazed tile, and the floors are ceramic tile. A smaller locker and shower room with similar specifications is located on the third floor, adjacent to the gymnasium, for the use of the gymnastic team and some of the intramural groups.

The service facilities for the intercollegiate athletics are located in the terrace addition and comprise as complete a set of such equipment as can be found anywhere. The space for this unit is approximately 30 feet wide and extends more than the length of the main building. The center of this section is a spacious equipment room, excellently supplied with shelves, storage bins and cupboards for storing and caring for supplies and equipment for approximately 2,000 men engaged in intercollegiate and freshmen competition. On either end of this equipment room are locker, shower, and training rooms, one group for varsity athletes and the other for reserves and freshmen. Each locker room is provided with ramp exits to both the stadium and practice fields.

Swimming Pools

Two excellent swimming pools afford ample opportunity for water activities. One is called the exhibition pool and is well equipped and arranged for competition. It is 75 feet long and 40 feet wide, providing ample space for six competition lanes. One high and two low boards amply provide for diving exhibitions and competition. One of the fine features of this pool is the sturdily built diving tower, which provides a strong, steady platform without the usual interference on the deck. It is constructed of steel "I" beams supported at one end by the balcony and at the other by two strong steel columns. There is seating capacity for 1,300 persons on three sides, while the fourth side

Recreation Pool



One End of Exhibition Pool

furnishes daylight through a large amount of window space. Artificial lighting is supplied by floodlights above the spectators' balcony, easily accessible for servicing. The exhibition pool is 7 feet deep at the shallow end, and 12 feet at the diving end. The bottom of the pool is glazed cream tile, and the walls are white ceramic tile inlaid with markings. One side has distances marked in meters and the other in yards. Chromium handholds are imbedded in both ends for convenience in starting back-stroke races.

The recreation pool is in a separate room and is intended primarily for teaching and general recreation swimming. It is 10 feet narrower than the other pool, being 30 x 75 feet. It is 3½ feet deep at its shallow end, and 8 feet at its deeper end. The tile and markings are the same as those of the larger pool. A distinctive feature of this pool is an acoustic ceiling with flush lights, tending to subdue the usual noise and thus rendering class instruction more efficient and easier.

Classrooms

One necessary feature that is often neglected in physical education buildings, namely, the provision for classrooms, has been adequately taken care of in this building. Numbering five in all, with various seating arrangements ranging from 30 to 150, these rooms provide for class instruction in all phases of the program. They are all on the second floor, along with staff offices, conference rooms, library, and study hall, and are well ventilated and lighted, and equipped with blackboards and electric clocks.

Gymnasiums

Practically the entire third floor is given over to gymnasiums. The general arrangement is a large floor flanked by two smaller ones, one of which is a separate room, the other marked off only by three steel posts. Since the building is primarily devoted to intramural and class programs, no provision for spectators was necessary and all the space could be used for activities. The main room is 90 x 152 feet and is equipped with three basketball courts and marked for tennis, volleyball, badminton and other recreation games. The north wing likewise provides for one basketball court and minor sport facilities similar to those in the main room. The south wing is a separate room, connected to the center room by double doors, devoted almost entirely to gymnastic activities, and is fully equipped with heavy and light apparatus. Two rooms, 9 x 27 feet, one opening into each of the wings, give

South Wing—Small Gymnasium

Part of Main Gymnasium

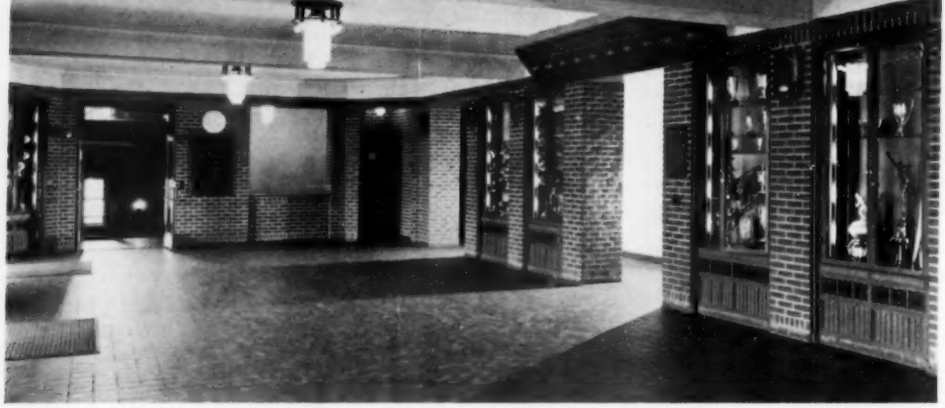
ample storage space for movable apparatus and equipment.

The roof is supported by steel trusses 20 feet from the floor. These are "I" beams and allow for attachment of hanging apparatus. Three large skylights in the main hall and one in each of the wings give ample natural light. The artificial lighting is well taken care of by numerous pendant lights high up in the superstructure and out of the way of flying balls.

In order to overcome the extreme rigidity that usually results from laying a floor on concrete, two layers of insulation material were placed on the concrete and each covered with pitch. The wood floor was then laid in mastic on top of this material. This arrangement provides for a certain amount of resiliency and tends to obviate some of the bad effects of a "dead" floor. The playing floor is a maple wood tile construction, each panel being composed of four 2¼ x 9-inch strips of cellized northern hard maple, making a tile 9 x 9 inches. These units are laid on the Cerocrete floor and bedded in Everbond mastic, which provides a very serviceable floor in every particular and has proved entirely satisfactory.

The Trophy Hall

Inside the front entrance to the building on the ground floor is an artistic lobby, 27 x 57 feet, which serves not only as a passageway to other parts of the building, but also as a trophy hall. All around this hall are cabinets reaching nearly to the ceiling, constructed of steel frames and sashes with heavy plate-glass windows and shelves. The walls are red face brick, and the floor is red tile. Information and ticket offices are located in one end. It provides a really delightful entrance to an efficient building.



Lobby and Trophy Hall

The Cost

Considering the kind and amount of additional facilities that this building provides, the cost was relatively small. The total cost of the main building was $350,096, and that of the terrace addition $72,439, making a grand total of $422,535. The construction of the building gives to the University of Minnesota one of the finest and most complete athletic plants in the country.

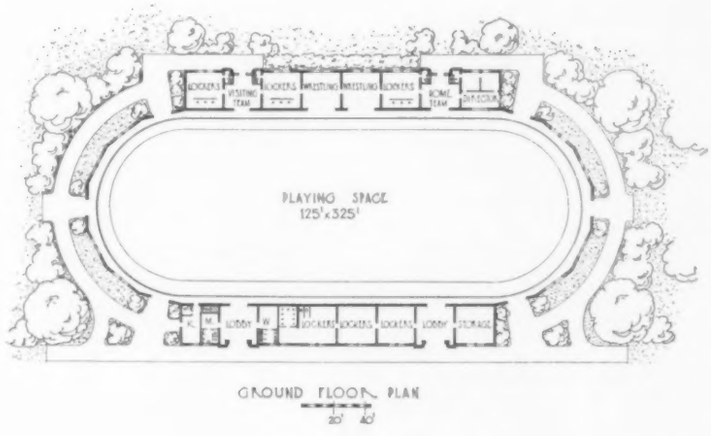
THE FIELD HOUSE OF SWARTHMORE COLLEGE

BY W. T. KARCHER AND LIVINGSTON SMITH

Architects, Philadelphia, Pa.

THE Field House of Swarthmore College is the first building of its kind to be erected by any central-eastern college. Probably this fact is the cause of much of the publicity that has been given it since its recent completion.

There are, however, other unusual things connected with the structure which may as well account for this rather widespread interest. First of these may be the probably natural surprise that a college of conservative Quaker origin should be the first in its locality to erect such a novel building adapted to a very modern use; yet this is easily understood when it is realized that, however conservative it may be in origin, Swarthmore College of today is a most progressive institution. Its policy, under the guidance of President Frank Aydelotte, is to be up to date not only in matters intellectual, but also in those architectural.



The next thing striking about this Field House may be its extreme simplicity of plan. It is a rectangle with rounded ends—if such an expression may be used—flanked on either side by a row of equal-sized rooms. For a building constructed to serve the many activities of this one, it is hard to visualize a simpler solution, and use has already proved that it fulfills its function perfectly.

The Plan of the Play Area

The major portion, or play area, of the building is 125 feet wide by 325 feet long. A visitors' space 4 feet wide surrounds the entire area. Immediately within the visitors' space and also surrounding the entire field is a 1/7-mile track. The general area within includes two hardwood-floored tennis courts or basketball courts and a large earth-floored portion for the practice of football, baseball, lacrosse, and field sports. Huge adjustable nets from floor to ceiling permit the division of this general area into various sections and enable the simultaneous practice of several games without interference.

The flanking rooms are devoted to students' lockers, showers and toilets, home teams, visiting teams, wrestling, supplies, director's office, and retiring rooms for men and women visitors. That is the plan in brief.

Materials and Construction

Most unusual of all things in connection with this Field House are probably the method and materials

of construction. In general it is a concrete monolith—foundations, exterior walls and interior partitions all being poured and cast in huge forms constructed of ply-wood. The division walls between the flanking rooms form the buttresses that take the thrust of the massive steel arches of the roof. This use of concrete on the campus of Swarthmore presented a serious problem all in itself.

Swarthmore undergraduates and alumni are justly proud of the beauty of their campus and its existing buildings. Therefore, when concrete was first mentioned for use in this case, serious fears were expressed regarding the possibly incongruous effect of this new huge stranger in their architectural midst. Practically all of Swarthmore's pre-existing buildings had been built of warm buff-gray local stone. Of course, the introduction of an ordinary dull cement-colored colossus would seem an atrocity. The general color of this building must at least harmonize in general with the present buildings. Literally, weeks were spent, therefore, in experimenting in order to discover a method of economical coloring. Artificial color was prohibitive in price, for the surface area was tremendous. Ultimately, with the assistance of O. E. McMullin, Research Engineer of the Cement Manufacturers' Association, the architects were able to secure a most satisfactory result by the use of a hematite-bearing clay discovered in the vicinity. Exhaustive tests proved no harmful effect to its strength. The additional cost was negligible.

Courtesy of Arch Roof Construction Co.

The finished design of the building, based on a model made by Robert E. Lamb, a member of the College Board of Managers, was of simple strength and pleasing effect. It is probable that it was this simplicity of design plus the result of color that ultimately produced a structure in such satisfactory harmony with its environment.

The Roof—Light and Ventilation

In addition to this unusual type of concrete construction of walls, there should also be noted the equally interesting type of trussless steel arch roof, of 125-foot span and 41-foot extreme clear height. It is of a design patented by the Arch Roof Construction Co. and is formed of straight members of steel riveted at slight angles. The result is not only of great strength, but also of simple grace. Upon this steel construction is placed a 2-inch plank roof covered with tarred felt, maroon in color.

Two huge skylights, 25 feet x 200 feet, and six minor skylights, made of actinic corrugated wire glass, admit ample light into the arena. There are no side windows opening into any of this playing space. This was purposely so arranged in order that no horizontal light might confuse the players. Ample ventilation is supplied through louvers in the side walls and monitors in the roof. Heat in winter weather is furnished from the College central plant.

The Economy of Simplicity

Above all, however, in speaking of the construction of this Field House we should mention the subject of economy. This naturally was a most important consideration, from the initial conception of the project. The general scheme was to carry forth and develop the simple plan with equally simple details. A system of repetition of equal sizes and dimensions secured maximum economy in the concrete construction, since forms could be repeatedly used. In addition to this, there was, as far as possible, a repetition of the use of equal sizes in all details—all windows, all exterior doors and all interior doors being of one size and design. This repetition applied as well, as far as possible, to skylights, of which only two sizes were used. There is no plastering of any kind in the structure. All plumbing and heating pipes are exposed. In spite of the intensive study given to the subject of economy, it should be borne in mind that all materials and workmanship were of the best quality. That the building was successful from the standpoint of economy is proved by the fact that its final cost was about 10 cents per cubic foot.

The new Field House is in a portion of the campus which in the future will be developed into a group of playing fields. In planning these fields, no accommodations are arranged for spectators; instead, attention is concentrated on the convenience and pleasure of the men who are actually playing the games. Exhibition games will be held on the north campus as heretofore. In time the building will be surrounded by a football practice field, a track, three fields for soccer, lacrosse and baseball. The whole surrounding

Football

Golf

Baseball

area will be planted and landscaped by the College in harmony with the remainder of the campus, under the direction of John C. Wister, of the Arthur Hoyt Scott Foundation.

Field House Facilities Give Impetus to Program of Sports Education

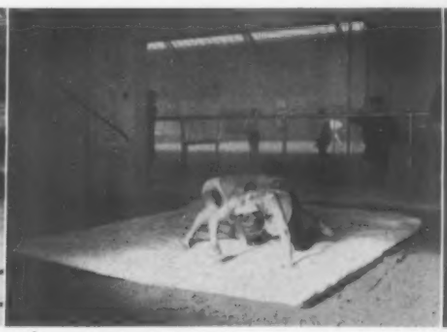
By Mark MacIntosh

Director of Athletics, Swarthmore College

THE aim of the Sports Education Division at Swarthmore is to offer in as attractive a form as possible a highly diversified program to induce the student to select the maximum of work his studies will allow. Freshmen and sophomores must meet positive minimum requirements, and juniors and seniors, whose participation in the program is entirely elective, are especially urged to take advantage of "carry-over" sports because they will soon have no further opportunity to play the major sports. The emphasis is not on physical exertion and perspiration, but on instruction and practice to develop the student to the point where he will carry on in a sport without any other enticement than the joy of accomplishment. The practice of bringing to the campus, for exhibition and instruction, outstanding performers in such sports as golf, tennis, badminton, swimming, boxing, track, handball and fencing, gives students a chance to rub elbows with champions and get expert instruction and inspiration from them.

The new Field House has greatly increased the possible range of activities. On the wood floor we can play basketball, tennis, badminton and volleyball, and do some tumbling; on the dirt floor we can play (practice) football, soccer, lacrosse, baseball, track and field sports (one large pit filled with peat moss is used for broad jump, high jump and pole vault); in the individual rooms along the sides of the main playing area we can box, wrestle, fence and do apparatus work (parallel bar, wall racks, chest weights, punching bags, sand bags and horizontal bar).

Within three or four weeks after the Field House opened, it was apparent that during the winter season many more sports would be played than last year, and that the number of participants would be quadrupled.



Photographs on this page by courtesy of Universal Newsreel

Fencing and Tennis

Wrestling

Lacrosse

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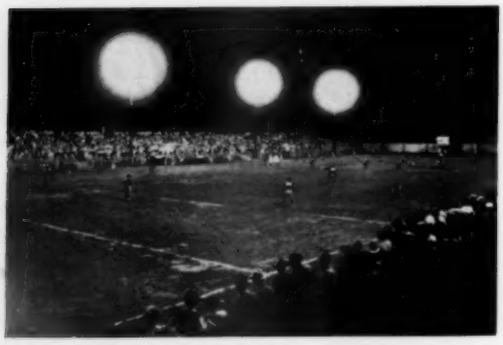
BENJAMIN PRODUCTS

FLOODLIGHTS for football fields, baseball fields, athletic fields, swimming pools, tennis courts, playgrounds, hockey rinks, etc.

Danville High School Field
Danville, Illinois



Middletown High School Field
Middletown, Ohio

Durango High School Field
Durango, Colorado

REFLECTORS for gymnasiums, field houses, basketball courts, laboratories, shops, vocational departments, drafting rooms, etc.

BENJAMIN "PLAY-AREA" FLOODLIGHT

Cat. No. 5751

Coaches and school authorities everywhere recognize Benjamin leadership in floodlighting for night football. Last season alone forty coaches reported average attendance increases of 261% on Benjamin floodlighted fields, while the country over more than 100,000 fans attended Benjamin floodlighted games.

Benjamin "Play-Area" floodlights are designed particularly for the special requirements of football field floodlighting. They have the famous Benjamin "two-in-one" construction which provides the powerful forward throw of light to effectively illuminate the far side of the field. No other floodlight matches its performance, durability and the protection of players and spectators from glare.

Providing the highest quality of illumination for all outdoor sport and recreational areas, the Benjamin "Play-Area" floodlight combines a large, open-type, diffusing porcelain enameled steel reflector with an inner auxiliary projector of etched Alzak aluminum. This combination provides the two distinctly different kinds of lighting necessary for correct football field lighting.

Reflector is 28½ inches wide and 17½ inches deep; finished green porcelain enamel outside, reflecting white inside. All metal fittings are cadmium plated to resist corrosion.

Designed for use with 750-1500 watt lamps and supplied with any of following styles of mounting brackets: Cross arm type for attaching to standard 4¼ inch wood cross arms; Cross arm with pipe clamp for clamping around 1 to 2 inch iron pipe and Pole Cap bracket to slip over top of 1½ or 2 inch iron pipe.

BENJAMIN "ELLIPTO-LITE" FLOODLIGHT

Cat. No. 5977

Open type floodlight of elliptical shape for floodlighting many kinds of sport and recreational areas where the exceptional lighting coverage of the "Play-Area" floodlight can be sacrificed. Combines a porcelain enamel steel reflector with an inner projector of etched Alzak aluminum. Unique, detachable hood construction makes possible the removal of reflector for cleaning. Two sizes of reflectors are available: one for 300-500 watt lamps and one for 750-1500 watt lamps. Floodlights are available with any of the following types of mounting brackets: Cross arm type for attaching to standard 4¼ inch wood cross arms; Cross arm with Pipe Clamp for clamping around 1 to 2 inch iron pipe and Pole Cap for slipping over end of 1½ or 2 inch pipe.

BENJAMIN "TENNIS COURT" REFLECTOR

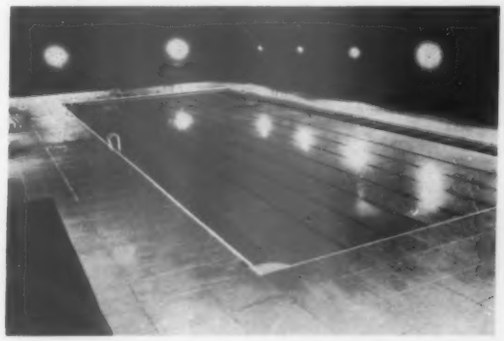
Cat. No. 4176

Benjamin "Tennis Court" reflectors are especially designed for the individual lighting requirements of tennis and provide exactly the distribution of light necessary for proper playing of this sport. Reflectors are etched Alzak aluminum and are available in either "Socket-Reflector" or patented Benjamin "Turnlox" types of construction. When used for certain locations on the court, reflectors are fitted with visors, as illustrated. Available for 750-1500 watt lamps only.

BENJAMIN "GLASSTEEL" GYMNASIUM UNITS

Cat. No. 7503

Benjamin Glassteel Diffusers are widely used for lighting gymnasiums, field houses, basketball courts, indoor tracks as well as all manner of laboratories, shops and vocational class rooms. Provide very finest quality of light which is soft and well diffused for elimination of glare and minimizing shadows. Comprise an opal glass globe in combination with a porcelain enamel reflector. Light is admitted through holes in top of reflector to ceiling to provide a cheerful appearance to room. When used to light gymnasiums and field houses, a special, heavy-duty wire guard is used to protect the glass globe from damage in case of flying balls.



Outdoor Swimming Pool

Outdoor Tennis Court

Gymnasium

Indoor Basketball Court

CROUSE-HINDS

ESTABLISHED 1897

Syracuse, N. Y., U. S. A.

CH 598

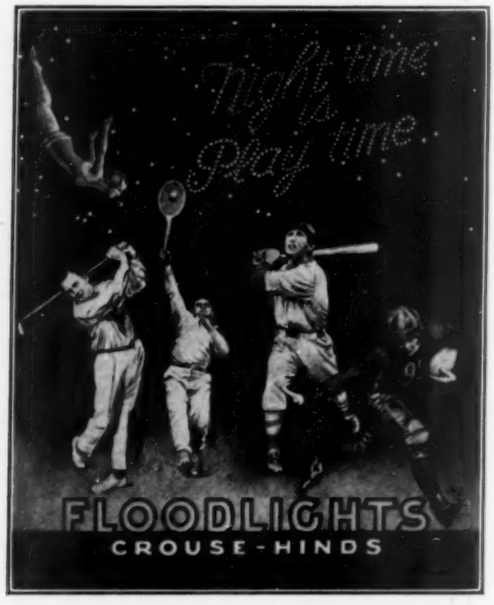
FLOODLIGHTS
for Night Sports

Night sports have been increasing in popularity year after year. This is due partly because of greater leisure time, but principally because floodlight design and manufacture have so greatly improved. Almost every sport shows greater attendance at night than during the day, and floodlighting provides increased hours for indulgence in amateur sport and recreation.

Modern illumination has made night football a most satisfactory game for both players and spectators. The ball is readily followed through running plays, forward and lateral passes, punts, and all the fast and intricate handling behind the line of scrimmage.

Illuminating engineers have designed lighting systems for almost every kind of sport. Specific plans and descriptions of equipment will gladly be submitted upon receipt of detailed requests.

Bulletin 2299, "Nighttime is Playtime," will be sent on request.

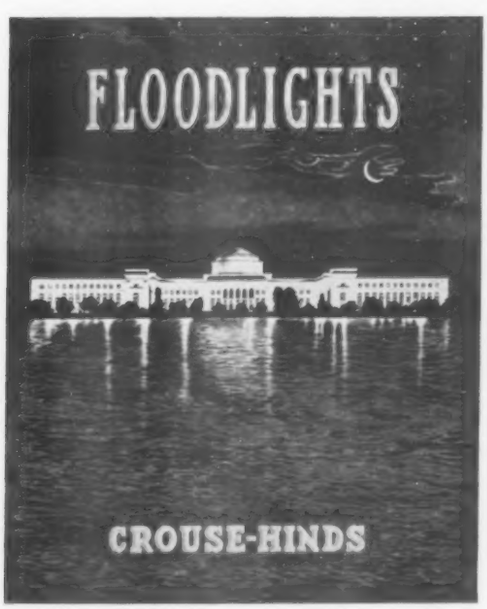


Type MUA is a universal, open type, 750 to 1500-watt floodlight which has a complete line of interchangeable and detachable reflectors. Any light distribution desired, from that of a spotlight to the widest spread floodlight, is available.

Type ADE-16 is a universal 1000-watt unit of sturdy construction and high efficiency. The unit is dusttight and weatherproof, and is constructed entirely of corrosion-resisting metal. Several combinations of lenses, reflectors, and lamps are available so that the beam of the projector may be varied from a narrow beam to a wide beam. Glass or polished Alzak reflectors are available.

Type FDE 1000 and 1500-watt floodlight has been developed for submersion in water such as in fountain and swimming pool installations. It can be furnished with various types of mountings for convenient installation under any condition. Cast bronze housings are standard for swimming pools. Glass or Alzak reflectors are available.

A new Floodlight Catalog, No. 316, describing and listing a complete line of Floodlights to meet every lighting requirement, will be sent on request.



Type MUA Alumalux

Type MUA Elliptalux

Type ADE-16

Type FDE

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES

This 1500 to 4000-Watt Open-type Floodlight is Available in Three Mountings

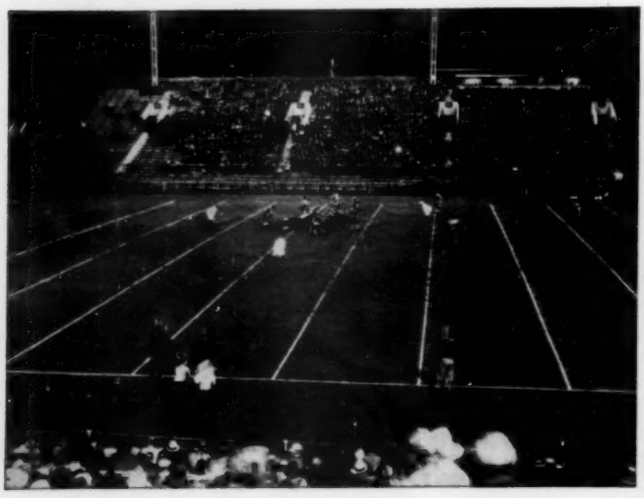
This 300 to 1500-Watt Light is Available in Five Mountings

G-E FLOODLIGHTS HAVE MADE NIGHT SPORTS POPULAR

In 1923, the first night football game was played by Tufts College and General Electric engineers, with light from G-E Novalux floodlighting projectors. Today G-E floodlights are lighting athletic fields for colleges, prep schools and high schools all over the United States; and athletic meets, football and baseball games, tennis, hockey and many other games and contests are held at night with great success.

FOOTBALL

Since 1930, more than 125 football fields have been permanently and adequately lighted by General Electric, with big increases in attendance and gate receipts.



Football practice, too, before five o'clock in the afternoon has often been difficult, or impossible, for some students to attend. The perfect illumination of the field attainable with G-E floodlights enables the field to be used for many additional hours each day.

For the football field, five poles on each side, four to six 1000-watt projectors on each pole (either open or closed type) are recommended.

BASEBALL

Additional revenue from gate receipts justifies the expense of installing floodlights for the baseball field. The floodlights should be mounted on poles high enough (70-90 feet) to be out of the usual angle of vision, or on top of nearby buildings or grandstands. Either open or enclosed type may be used.

Open Type Floodlights are generally used for the lighting of large areas, particularly baseball and football fields. These lights are available in ratings from 300 to 4000 watts, and in five types of mountings. **Write for Booklet GEA-1973.** These lights are easy to install and to clean, and extremely inexpensive.

Side View of Type L-31, Novalux Projector with clear plain lens

Enclosed-Type Floodlights are of course more completely protected from the elements than the open type. They are often used for evening football and other games where additional revenues justify the expense. They are extensively used for swimming pools, night lighting of buildings, monuments, etc. Type AL-29 is small size, used with a 250-watt lamp; Type AL-30 uses a 500-watt lamp; and Type AL-31 uses a 1000-watt lamp. A wide variety of door glasses provide flexibility in beam pattern.

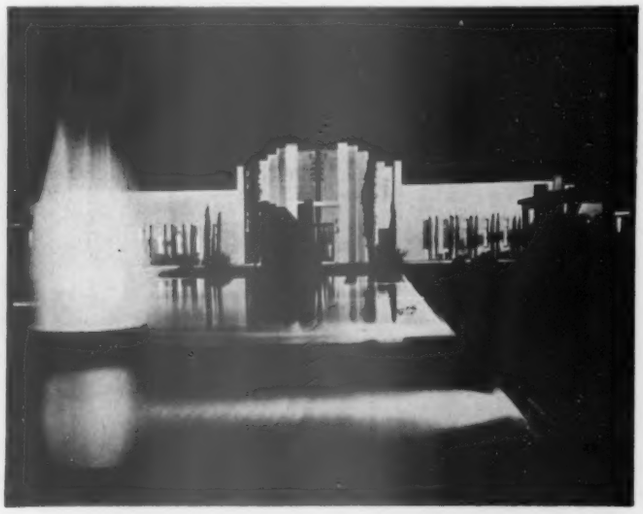
Type L-41—Novalux Projector, Submersible Fountain Type, for Swimming Pools

TENNIS

Open-type floodlights are inexpensive and are generally used for this sport. Eight small floodlights will light one or two courts; ten will light three courts. General Electric engineers have prepared layout drawings for lighting tennis courts and for many other applications. Floodlighted tennis courts are always popular.

SWIMMING POOLS

Two general systems of lighting swimming pools are being successfully used—overhead lighting, where floodlights illuminate the surface of the water; and underwater lighting, where floodlights are located in the side and end walls of the pool below the surface. The latter method makes every movement of the swimmers clearly visible—an important safety factor.



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Playground and Swimming Pool Equipment
Gym Mats — Foot Baths — Floodlights — Mats

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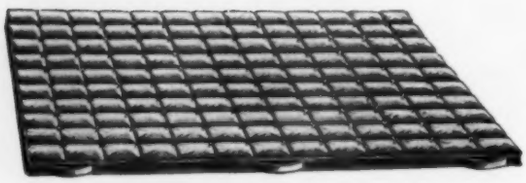
GYM MATS



American Gym Mats are designed by men of actual athletic experience aided by physical educational instructors. The springy resilience of American Mats make them easier on the athlete . . . less jolt and jar. Finest quality army duck cover filled with genuine pure cattle and goats' hair. Strongly tufted and sewed. Extra reinforcing.

FOOT BATHS

For Prevention and Control of ATHLETE'S FOOT

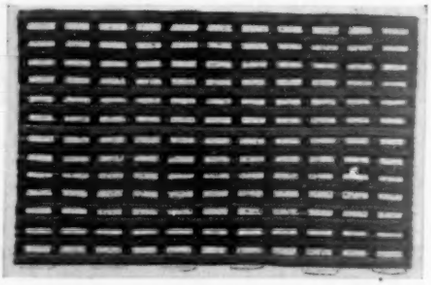
American Foot Baths and Hypochlorite are used in hundreds of Schools and Colleges for the control and cure of Athlete's Foot. Kills fungi in less than 30 seconds. Full information and prices on request.

AMERICAN FLOOD-LIGHTS

An efficient and economical floodlight for Tennis Courts —Football Fields — Playgrounds, etc. Send for large list of users and full information A-FL.

RUBBER MATS

For Doors, Halls and Corridors



A thoroughly constructed and economical mat that will stand the wear and tear of constant traffic. Restful and easy on the feet. Used in hundreds of schools, clubs and other public institutions.

AMERICAN PLAYGROUND EQUIPMENT

For Strength—Durability and Safety

School children in every section of the land play on American Playground Equipment. Designed for rugged wear and long, hard use. A complete selection of sizes and variety to fill every requirement. Slides, Swings, Seesaws, Merry-go-rounds, Wave Strides, Ocean Waves, Giant Strides, etc. Send for complete 48-page catalogue.

YOU CAN DEPEND ON AMERICAN FOR PROMPT SHIPPING SERVICE

ATLAS PORTABLE BLEACHERS

(PATENTED)

580 Fiske Drive
Detroit, Michigan

No Overlapping Boards in an Atlas Bleacher

ATLAS PORTABLE BLEACHER SEATS

For Athletic Fields, Gymnasiums, etc.

In selecting bleacher seats for either outdoor or indoor use, the important features to be considered are: safety, strength, durability, appearance, comfort, ease of handling, minimum space in transporting and storing, and lowest average yearly cost. Atlas Portable Bleachers meet all these requirements.

Safety: Although Atlas bleachers are set up in a jiffy (two men easily setting up 120 seats in 15 minutes), there is no bleacher made that is superior to the Atlas in safety. Under the strain of a full-capacity load of a surging, stamping crowd, they are as safe and sturdy as a permanent structure. The **four-stringer assembly,** an exclusive Atlas feature, means **safety.** The **Bethlehem steel tension bars,** instead of wood sleepers, mean **safety.** The **bolts,** instead of wood screws, spell **safety.** And the fact that **every strain-bearing part is held by malleable castings,** also means an **added margin of safety.**

Other Important Features:

One thing that immediately strikes the eye of the observer is the long line of **even seatboards** in any Atlas bleacher section. (See illustration above.) Boards laid this way give added seating capacity and neat appearance.

Another feature, not so readily seen, is the **Acme corrugated steel bar imbedded deep in the ends of all seat boards and foot boards**—the most perfect method of preventing splitting ever devised.

For complete description, illustrations and specifications, write for booklet, "Atlas Portable Bleachers," 580 Fiske Drive, Detroit.

Rear View Showing a Single 16-Foot Section Supported by Four Jack Assemblies—Capable of Seating 120 People

BRADLEY WASHFOUNTAIN CO.

Manufacturers of Group-Washing Equipment

2231 West Michigan Street, Milwaukee, Wis.

REPRESENTATIVES IN ALL PRINCIPAL CITIES OF THE UNITED STATES, CANADA, AND MEXICO

THERE'S A BRADLEY GROUP-WASHING FIXTURE FOR EVERY GROUP-WASHING REQUIREMENT

ADVANTAGES

- quick low-cost installation
- only three plumbing connections
- water economy
- improved sanitation
- reduced janitor labor
- extraordinary durability

BRADLEY WASHFOUNTAINS

Bradley Washfountains are compact, self-contained fixtures expressly designed for modern group washing and are in widespread use among schools of all kinds, from kindergartens and grade schools to high schools and colleges. They are installed in washrooms, shops, and school-rooms proper, as well as at entrances to school cafeterias—in fact, they are employed to advantage wherever it is desired to accomplish group washing efficiently and economically.

Materials and Equipment

Bradley Washfountains may be had in the following materials:

Precast Marble or Stone — Stainless Steel
Enameled Pressed Iron — Porcelain
Acid-proof Stoneware

Fittings are of heavy brass, chromium plated, satin finished. Standard equipment includes cake soap tray and Bradley manually - operated mixing valve. Special soap dispensers, thermostatic mixers and sectional sprayheads may be had if desired.

Enameled Pressed Iron Washfountain

SPECIFICATIONS OF BRADLEY WASHFOUNTAINS

Type	Characteristics	Design	Dia., In.	Capacity	Remarks
A	Hand - controlled. Supplies and vent from below.	Circular	54 36	10 users 6 users	All piping connections are concealed.
B	Hand - controlled. Supplies and vent from above.	Circular	54 36	10 users 6 users	Popular for remodeling jobs.
C	Hand - controlled. Supplies and vent through wall or floor.	Semi-circular	54 36	6 users 3 users	Wall type for narrow or irregular washrooms.
D	Foot-controlled. Supplies and vent from below.	Circular	54 36	10 users 6 users	Foot-control of water flow assures maximum sanitation and water saving.
F	Foot-controlled. Supplies and drain through wall or floor.	Semi-circular	54 36	6 users 3 users	Similar to C plus foot-control.
G	Hand - controlled. Supplies and drain through wall or floor.	Semi-circular	54	6 users	Available in enameled iron and stainless steel.
H	Hand - controlled. Supplies from below, vent from above.	Circular	54 36	10 users 6 users	All piping connections concealed except central vent.
O	Hand - controlled. Supplies from above, vent from below.	Circular	54 36	10 users 6 users	Popular for remodeling.
R	Foot-controlled. Supplies and drain through wall or floor.	Semi-circular	54	6 users	Available in enameled iron and stainless steel.
W	Hand - controlled. Supplies and vent through wall or floor.	Semi-circular	54 36	6 users 3 users	Wall type. Alternate to "C."

BRADLEY GROUP SHOWERS

Bradley Group Showers, like Bradley Washfountains, are designed for modern group service and have been widely adopted by schools and institutions of all kinds. They are available in circular and semi-circular models, accommodating 5 and 3 users respectively, *each in a separate roomy compartment.*

Specifications

The central column and all frame members of Bradley Group Showers are of cold drawn seamless steel tubing. Standard partitions are of patent leveled cold rolled, 16 gauge steel. The fixtures are finished in gray high-temperature baked synthetic enamel. Fittings are of heavy chromium plated brass, satin finished. Supply connections may be from above or below.

OTHER BRADLEY FIXTURES

In addition to Washfountains and Group Showers the Bradley line includes Drinking Fountains, Shower - Dressing Room Combinations, Foot-fountains and Street and Playground Showers.

Bradley Drinking Fountain

BUCKNER MANUFACTURING CO.

Pioneers and Leaders in Hoseless Irrigation

1615 Blackstone Ave.
Fresno, California

418 North Broad St.
Elizabeth, New Jersey

Sprinkling Equipment for
LAWNS — ATHLETIC FIELDS — POLO GROUNDS — TENNIS COURTS — GARDENS — PLAY GROUNDS

Buckner irrigation system in operation on Norlin Stadium, University of Colorado. Over four hundred such fields are using Buckner equipment with entire satisfaction

Buckner sprinkling equipment has long been recognized as the leader in their field. Buckner sprinklers are characterized by their slow, even rotation, fine breakup of the water, uniform distribution, and long lasting qualities. They are built in a wide range of performances to fit every need or operating condition.

Buckner quick coupling valves and underground sprinklers are built in special models for installation in athletic fields, polo grounds and play areas where protection to players is of vital importance.

Space in this book does not permit a full description of our complete line. We therefore invite you to write for our catalog which gives all particulars. We maintain a competent engineering staff to advise you in the design and building of water lines for irrigation purposes.

Schools and institutions of all kinds are enthusiastic users of Buckner Sprinklers

THE EVERWEAR MFG. CO.

35-65 S. Sycamore Street

Springfield, Ohio

EverWear
PLAYGROUND APPARATUS

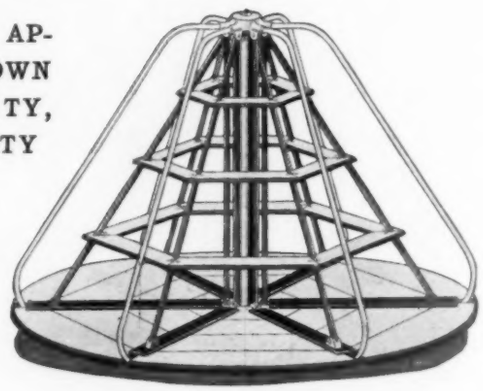
Playground Apparatus, Beach and Pool Equipment

EVERWEAR RECREATION APPARATUS IS WORLD KNOWN FOR SAFETY, DURABILITY, BEAUTY AND PLAYABILITY

Write for Catalogs

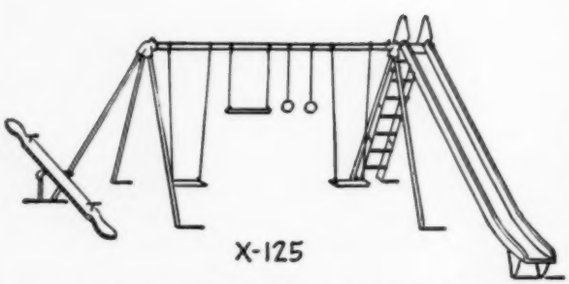
EVERWEAR MERRY-WAVE-STRIDE
(Patented 1740304)

This is the original of this splendid outfit. Accommodates up to 15 children. The name describes its motion and suggests its uses: "Merry" for merry-go-round; "Wave" for ocean wave; "Stride" for giant stride. No. X-225 Merry-Wave-Stride.



EVERWEAR WHIRLING CLIMB
(Patent applied for)

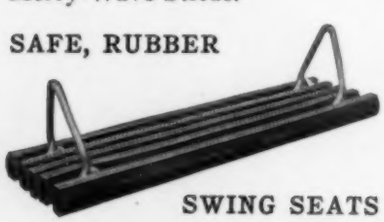
This exclusive Ever-Wear outfit is unique and attractive for the playground. Accommodates up to thirty children. Has a circular motion, like a merry-go-round, and the children climb all over it: the higher they climb, the closer they are to the center, which constitutes a vital factor to its safety. No. M-555 Whirling Climb.



EVERWEAR JUNIOR COMBINATION

This is the most attractive combination of play units ever arranged on one frame. It is particularly adapted for the playground where a wide variety of play functions are desired within a comparatively small area. The outfit is 8 feet high and 20 feet long. No. X-125 Junior Combination Outfit.

SAFE, RUBBER

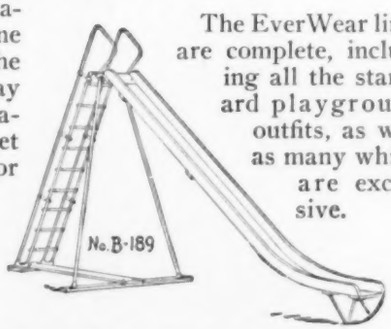


SWING SEATS

EVERWEAR SR-206 SPRING-RUBBER SAFETY SEAT FOR SWINGS
(Covered by U. S. and foreign patents)

This safe swing seat gives an element of safety to the swing which it has never had; changing an outfit classed as very dangerous, into one which can take its fine place on the playground without fear of results. "Reduced our accidents 70 per cent." Investigate them.

The EverWear lines are complete, including all the standard playground outfits, as well as many which are exclusive.



EVERWEAR PLAYGROUND SLIDES

EverWear slides, of all types and sizes, are scientifically designed to be safe; are built strong so they will endure. No. B-189, 16-foot straight slide is illustrated.

EVERWEAR STANDS WEAR AND TEAR

KAUSTINE COMPANY INC.

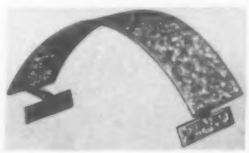
Engineers and Manufacturers of Sewage Disposal Equipment

Perry, N. Y.

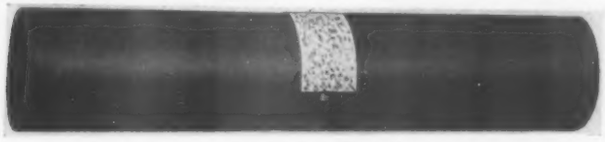
E-Z DRAIN TILE CONNECTORS

For Athletic Field Drainage

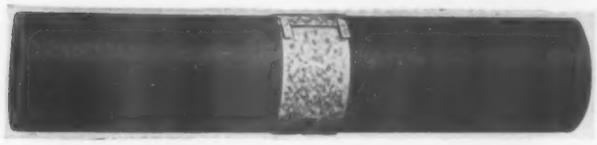
The E-Z Drain Tile Connector enables absorption and drainage tile to be installed more rapidly and conveniently than ever before, and results in perfect alignment, equal spacing and firmly covered joints. The importance of properly draining football and baseball fields, and athletic fields in general, is well understood. When drain pipe is laid, be sure to specify E-Z Drain Tile Connector—economical because of its rapid installation and because it eliminates costly repairs to the line. Two types are furnished, to meet any soil condition; each type packed 100 to a box. Your jobber can supply you. If not in stock, order direct from address above. Try one installation with this new tile connector and you will never go back to the less efficient tar paper caps or burlap wrappings.



(At Right and Below)—
Style No. 1 **is used where gravel lines the bottom of the trench, and where the back-filled soil is firm. The upper half of the joint is covered, sealing the joint effectively against fill-ins or earth dams. The lugs on either side go inside the tile and insure proper spacing. These lugs incidentally, are easily bent with the fingers and can be readily inserted in the tile end. Style No. 1 is regularly furnished for 4-inch tile. Connectors for 5-inch and 6-inch tile can be furnished on request.**



(At Left and Below)—
Style No. 2 **is designed especially for installations in sandy, open soils. This type extends entirely around the tile, forming a strong collar which holds the tile ends securely in place. The bottom half is slotted, and spacing of the tile is automatic. The lugs are adjustable, permitting easy adaption of the connector to any style of tile manufactured and to any irregularities in the tile itself. Furnished only for 4-inch tile.**



Illustrated Circulars

We shall be glad to mail on request illustrated circulars on the **Kaustine Septic Toilet** and on the **E-Z Drain Tile Connector.**

Detailed literature is also available on:

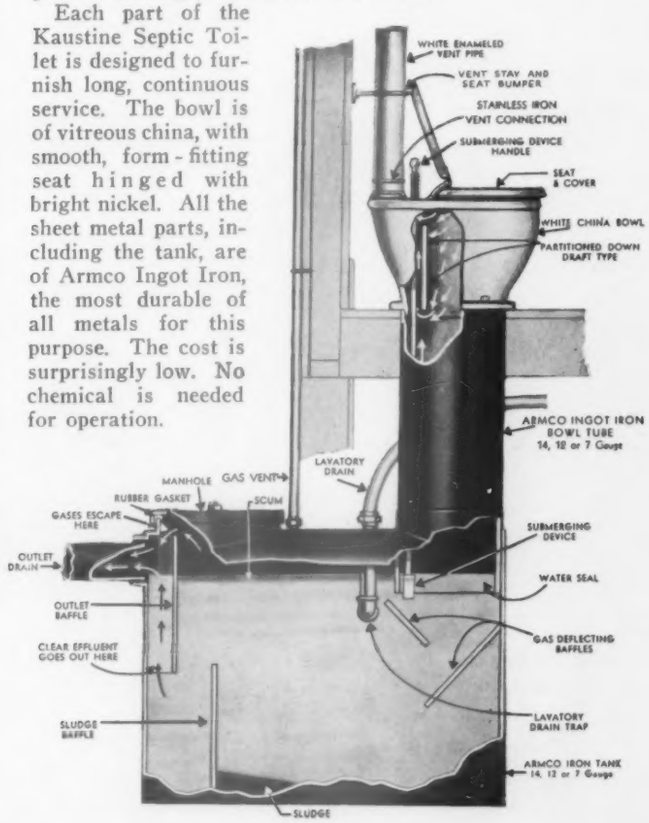
Kaustine Septic Tanks for Centralized Schools
Kaustine Septic Toilets for Rural Schools

KAUSTINE SEPTIC TOILETS

For the School Stadium

Wherever the athletic field is at a distance from the school or college buildings, the installation of Kaustine Septic Toilets in the stadium or field house provides a thoroughly satisfactory sanitary indoor toilet system which has all the advantages of a flush toilet without requiring a supply of running water. A competent Kaustine engineer will study ground structure, moisture content, and assist with specifications for the correct type and capacity sanitary toilet system suited to your school's exact needs. The Kaustine Septic Toilet System will arrive completely constructed ready for installation. Simply make the excavation of the required size, place the tank in the hole, construct leaching bed or dry pit for drainage, and cover with earth.

Each part of the Kaustine Septic Toilet is designed to furnish long, continuous service. The bowl is of vitreous china, with smooth, form-fitting seat hinged with bright nickel. All the sheet metal parts, including the tank, are of Armco Ingot Iron, the most durable of all metals for this purpose. The cost is surprisingly low. No chemical is needed for operation.



THE MATHIESON ALKALI WORKS (INC.)

60 East 42nd Street, New York, N. Y.

PLANTS

Niagara Falls, N. Y., Saltville, Va., and Lake Charles, La.

BRANCH OFFICES

Charlotte, N. C., First National Bank Building
Cincinnati, Ohio, Dixie Terminal Building
Philadelphia, Pa., Widener Building
Chicago, Ill., 410 North Michigan Avenue
Houston, Tex., Second National Bank Building
Providence, R. I., Hospital Trust Building
Washington, D. C., 1625 Eckington Place, N.E.

PRODUCTS

- **H T H (Concentrated hypochlorite)**
- **H T H-15 (Germicide)**
- **Lo-Bax**
- **Liquid Chlorine**
- **Anhydrous Ammonia**
- **Aqua Ammonia—26°**
- **PH-Plus (Fused alkali)**
- **MaFoS (Dishwashing cleanser)**

H T H

For a wide variety of sanitary purposes, particularly around the swimming pool, locker room and gymnasium, H T H is a most convenient and reliable source of available chlorine. Concentrated, H T H contains over 70% available chlorine. Moreover, it retains this high strength in warm weather and during long periods of storage.

H T H is a dry, free-flowing powder, readily soluble in water. It is shipped in cases of one dozen 3¾-lb. cans, each can containing 2½ lbs. of available chlorine.

For Swimming Pools

At thousands of swimming pools throughout the country, H T H is used to chlorinate pool water, for general disinfection of surroundings and for prevention of Athlete's Foot. A sanitation routine which provides germicidal and fungicidal protection in and around the pool is easy and economical to follow with this concentrated hypochlorite. (Write us for complete directions.)

For pool water purification, H T H can be added direct to the pool in powder form, or fed in solution form with simple, inexpensive equipment. At many pools where liquid chlorine is used for regular chlorination, a supply of H T H is kept on hand for emergency use in case of a breakdown of pumps or chlorinating equipment, or an interruption in the power supply.

To Prevent Athlete's Foot

Locker rooms, shower rooms, toilets, pool runways, etc., are undoubtedly among the worst offenders in the spread of Athlete's Foot.

Health authorities agree that the best preventive is a careful sanitary routine which includes the use of hypochlorite solutions such as those made from H T H and Lo-Bax, both in footbaths and for general disinfection of surfaces which may transmit infection. Moreover, many States now require hypochlorite footbaths at public pools.

Sterilizing and Bleaching

School laundries, like commercial laundries, find that H T H solutions are uniform and economical for bleaching and sterilizing linens, towels, uniforms and other white goods, and as a sterilizing rinse for cotton bathing suits. H T H enables them to avoid the danger of over-bleaching, which shortens the life of fabrics, and the alternate danger of inadequate protection.

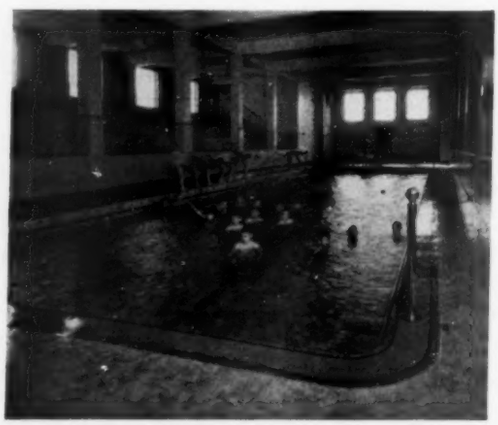
OTHER MATHIESON PRODUCTS

H T H-15—An all-purpose germicide and deodorant which is ideal for use in school kitchens, dormitories, camps, etc. H T H-15 contains 15% available chlorine and is simply added direct to water by the spoonful.

Lo-Bax—A convenient chlorine carrier packed in 1¾-lb. bottles and containing 50% available chlorine. For preparing footbath solutions and for use around shower and locker rooms where limited quantities of hypochlorite are required.

PH-Plus—A fused alkali manufactured especially for restoring to swimming pool water the natural alkalinity it loses in use and during filtration. Makes pool water "feel fine."

MaFoS—A new type of cleanser for dishwashing machines which comes in the form of dense, water-free briquets. Tests prove it more efficient and economical than powdered cleansers.



Swimming Pool at Public School No. 12, Troy, N. Y., Where H T H Is Used to Protect Against Athlete's Foot

METAL OFFICE FURNITURE COMPANY

Grand Rapids, Michigan

FACTORIES IN Grand Rapids Michigan

BRANCHES IN
New York City 604 W. 37th St.
Boston 115 Purchase St.
Los Angeles 923 E. Third St.
Seattle 609 Third Ave.

DEALERS IN ALL PRINCIPAL CITIES

STEELCASE *Business Equipment*

TERRELL STEEL LOCKERS

4 ADDED ADVANTAGES AT NO EXTRA COST

Adaptability

A complete range of sizes and styles meets every need of school or gymnasium. Any grouping of full-height, double-tier or box lockers can be supplied.

Safety Handle

All fastening points are concealed in handle. Pilfer-proof, since handle cannot be pried off. Padlock eye is also concealed in handle.

Latching Bar

No meddling possible because it is enclosed and protected between return flange on door and a formed channel. This channel adds strength to the door.

Pre-Locking Device

Positive in operation, pick-proof, simple in design. Two working parts. When door is opened, padlock may be replaced and locked, or key turned, then when door is closed it is automatically locked.

Silenced Operation

Soft molded rubber bumpers are securely riveted and tenoned into door jambs. Similar bumpers silence latching bars. This eliminates noise.

Sturdiness

Rigid construction, acetylene welded frame corners, angle-type legs which are a part of the locker frame—these and other features add to the strength of Terrell Lockers.

Appearance

Attractive finishes, no weld marks, rust-proof bolts (none on fronts), concealed hinge-pins—these enhance the appearance of Terrell Lockers.

STEEL BOOK STACK UNITS

Here is modern steel book shelving in its best and simplest form—designed and built for the utmost in service for educational institutions.

Easily planned — easily installed—very reasonably priced.

Book Stack Units can serve you as efficiently as they are serving many other leading universities and schools.

SIMPLIFIED, MODERN STEEL BOOK SHELVING

Simplicity

Sold as units, no complicated parts to figure. Intermembering units (of varying widths if required), with duplicating parts omitted, match perfectly in building an assembly.

Sizes

Offered in an assortment of sizes—widths 30″, 36″, 42″—depths 9″, 12″—heights 6′ 6″, 7′ 6″, 8′ 6″.

Capacity

These Book Stacks will accommodate 10% more books than sectional glass door bookcases of the same height. Rounded front posts give maximum shelf width.

Flexibility

A combination of sizes for any space. Shelves adjustable every inch for books of any height. Easily and quickly rearranged.

Strength

The construction of upright posts, tops, bases and shelves insures strength and rigidity in every part. No sagging of shelves even under the heaviest load.

Protection

No rough bolts or raw edges of steel can come in contact with books or hands. Front edge of shelf is triple-flanged for added protection.

Beauty

Designed, built and finished to harmonize with the finest furnishings. The attractive cornice top adds a touch of conservative artistry to each unit.

MIDLAND
CHEMICAL LABORATORIES, Inc.

Dubuque, Iowa, U. S. A.

GYMLOH

Midland Gymloh is an outstanding finish for Gym floors. Due to its high Bakelite content it will not rubber burn, is hard, tough and resilient.

Midland Gymloh is non-slippery, assuring safety for Athletes. Simply apply Gymloh to a clean floor with a lambs wool mop and let it dry. You will be surprised at the results—a filled floor with a brilliant finish.

ATHALOH

This product was conceived by our chemists for use in stepping-pans and as a special disinfectant in and around shower-rooms, pools and locker rooms to prevent the dangers of the infection known as "Athlete's Foot."

GERMOLYPTUS

Midland Germolyptus is a wonderful product for spraying Wrestling Mats, Football Uniforms and articles of this kind to keep them sanitary. It is non-poisonous, non-irritating and stainless. As an all around disinfectant, germicide, and antiseptic, Germolyptus has no equal.

BASIC LIQUID SOAP

Midland Basic Liquid Soap is an ideal Liquid Soap for Schools. It contains cocoanut oil, glycerine, olive oil and other fine ingredients, carefully blended to a soft, smooth, non-irritating liquid soap that has a pleasant odor.

Midland Basic Liquid Soap may be diluted to any strength desired.

ANTISEPTIC OIL

Midland Antiseptic Oil will aid in caring for skin irritations such as chafing, rashes, chapping, etc. It is soothing, healing and has decided germicidal and antiseptic values. Antiseptic Oil is not sticky or greasy.

These qualities make Antiseptic Oil a high grade, superior product.

WE MANUFACTURE A COMPLETE LINE OF FLOOR FINISHES, WAXES AND CLEANSERS INSECTICIDES DISINFECTANTS LIQUIDS AND JELLY SOAPS.

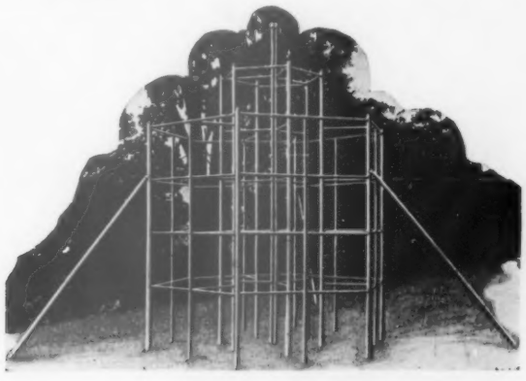
MITCHELL MANUFACTURING CO.

"Betterbilt"

Playground Apparatus and Beach and Pool Equipment

Milwaukee, Wisconsin

THREE POPULAR NUMBERS



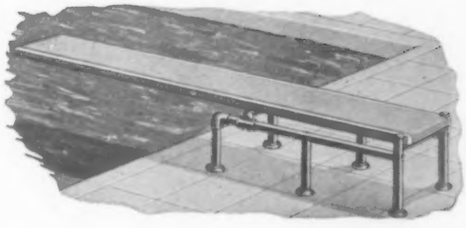
NO. D-02 ALL-STEEL SLIDE

While the original Mitchell All-Steel Slides are standard equipment on countless play areas, Mitchell is now offering a still greater value in All-Steel Slides.

Their sturdy construction, perfect design and long life command the attention of all interested in better values. There are no sharp edges or similar hazards to cause injury.

You will want to know more about the strong deep side rails, unique chute construction, the use of either galvanized Armco Iron or Stainless Steel bedway bottoms, the extra heavy metal ladder equipped with safety hand rails.

Made in two sizes. **D-02:** Height 8½ feet, length 16 feet—**D-04:** Height 10 feet, length 20 feet.



NO. DS-34 ONE METRE DIVING STAND

This is only one of many Beach and Swimming Pool devices:—diving stands of various designs, diving boards, diving towers, pool ladders, life guard chairs, water slides.

NO. G-2 CLIMBING GYM

Mitchell Climbing Gyms provide muscular development of the children and also instill self-confidence, initiative and ambition. By the attachment of a standard playground slide Mitchell Climbing Gyms create a desire for all children to climb. There is never a dull or idle moment where Mitchell Climbing Gyms are installed.

Due to their compactness, they provide in a small area, more development of mind and body, as well as recreation for a greater number of children than any other device on the market today.

Mitchell Climbing Gyms are shipped in panels from factory making it only necessary to attach the corner posts to the various panels when erecting. All parts fit perfectly.

PROTECTING THE CHILD

The best protection for boys and girls is activity which is safe, healthful, and enjoyable. Such activity will keep them off the street and out of danger, and assist in developing them into able bodied and alert minded men and women. MITCHELL specializes in facilities which help in achieving these results, at minimum cost.

FOLD-O-LEG TABLE

A utility all purpose table which is practical, attractive, inexpensive, sturdy built. For schools, libraries, kindergartens, cafeterias, colleges, auditoriums, gymnasiums recreation centers, parks. Made in 17 sizes, 3 heights, top with either fir veneer, Tempered Masonite Presdwood or linoleum. Write for circular explaining the many exclusive features.

BOOKLETS

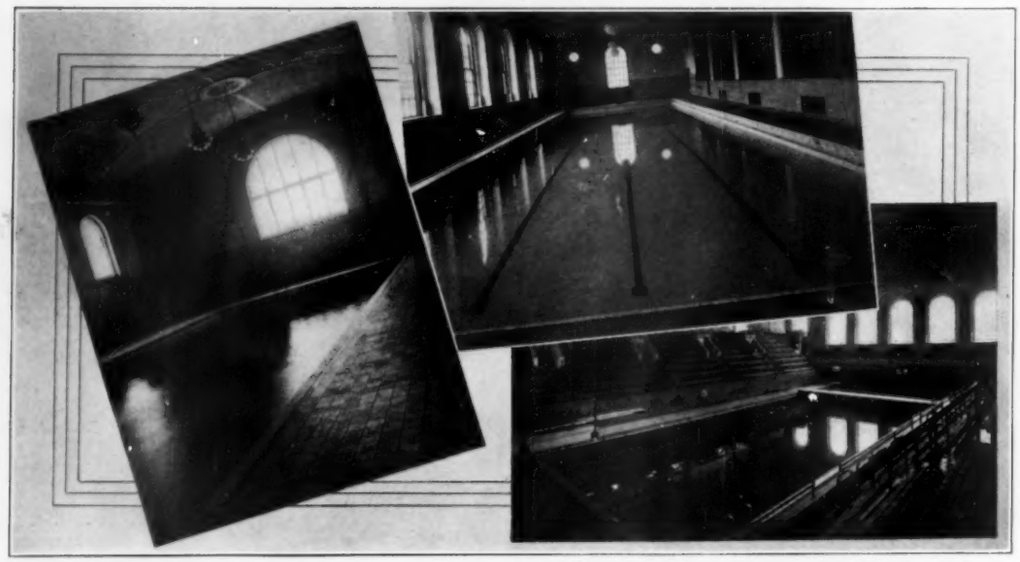
(Illustrated)

1. Mitchell Playground Apparatus
2. Mitchell Swimming Pool Equipment
3. Mitchell Fold-O-Leg Tables
4. Complete Playground Apparatus Catalog.

NORWOOD ENGINEERING CO.

Filters for Natatoriums

Florence, Mass.



These popular pools at Dartmouth, Smith and Harvard have Norwood Filters

MANY SCHOOLS AND COLLEGES HAVE SELECTED NORWOOD FILTERS FOR THEIR SWIMMING POOLS

(Including Practically Every College in New England)

School Officials Everywhere Praise the Efficiency of Norwood Filters

ENTIRE SATISFACTION SINCE 1924

SMITH COLLEGE, NORTHAMPTON, MASS.

We are pleased to say that the filters installed by you at our Swimming Pool in 1924 have given entire satisfaction.

FRANKLIN KING,
Superintendent.

DOES ITS WORK SPLENDIDLY

WORCESTER ACADEMY, WORCESTER, MASS.

The filter installed by the Norwood Engineering Company has been satisfactory and done its work splendidly.

R. J. DELEHANTY,
Director of Physical Training.

HEARTILY RECOMMENDS NORWOOD FILTERS

CHRISTIAN COLLEGE, COLUMBIA, MO.

It gives me pleasure to state that the triple filters of the Norwood Engineering Company of Florence, Mass., in our natatorium have proved entirely satisfactory. I would **heartily commend** the use of these filters to anyone contemplating the construction of an up-to-date natatorium.

MRS. L. W. ST. CLAIR-MOSS,
President.

A Few of the Norwood Filter Users

Agnes Scott College, Decatur, Ga.
Amherst College, Amherst, Mass.
Bristol High School, Bristol, Conn.
Dartmouth College, Hanover, N. H.
George Peabody School, Nashville, Tenn.
Hamline University, St. Paul, Minn.
Harvard University, Cambridge, Mass.
Holyoke High School, Holyoke, Mass.
Horace Mann School, New York City
Hotchkiss School, Lakeville, Conn.
International YMCA College, Springfield, Mass.
Middlesex School, Concord, Mass.
Mount Ida School, Newton, Mass.
New Sullins College, Bristol, Va.
New York Military Academy, Cornwall, N. Y.
Pasadena Military Academy, Pasadena, Calif.
Peekskill Military Academy, Peekskill, N. Y.
Phillips Academy, Andover, Mass.
Ridgefield Park School, Ridgefield Park, N. J.
Rutgers College, New Brunswick, N. J.
State Normal School, Emporia, Kans.
State Normal School, Spearfish, S. D.
University of Virginia, Charlottesville, Va.
Ward-Belmont School, Nashville, Tenn.
Wellesley College, Wellesley, Mass.
Wesleyan University, Middletown, Conn
Wethersfield Ave. School, Hartford, Conn.
Yale University, New Haven, Conn.

FREE HELP IN POOL PLANNING

Norwood engineers have been studying water filtration problems for nearly forty years. When you plan to build a new pool or make changes in a pool now in operation, our engineering department will be glad to advise you. Write for a copy of the Norwood book on Filtration and Recirculating Systems for Natatoriums.

PENNSYLVANIA SALT MANUFACTURING CO.

ESTABLISHED 1850

Executive Offices: Widener Bldg., Philadelphia, Pa.

BRANCH SALES OFFICES

New York Chicago St. Louis Pittsburgh Tacoma Wyandotte

Perchloron means safety plus economy in swimming pools

For effective germicidal action and to purify water for your pool, nothing could be simpler to use or more economical than Perchloron.

This highly concentrated, convenient source of chlorine serves you well for a number of important purposes. Use it in shallow trays to combat athlete's foot—as a bleach and sterilizer for towels—as a deodorizer and disinfectant in spray or powder form.

Write today for descriptive literature on this indispensable product.

TRADE MARK

THE AMERICAN SCHOOL AND UNIVERSITY

SAVE AND PLAY SAFE WITH Perchloron

- ★ High available chlorine content (over 70%)
- ★ Comes in stable, concentrated form, stays full strength
- ★ Dissolves readily in water
- ★ Perfectly uniform, simplifying technical supervision
- ★ Packed 12 handy-sized cans to the case—no return containers to bother with
- ★ Highly economical because it keeps so well and so little goes so far.

PITTSBURGH - DES MOINES STEEL COMPANY

3425 Neville Island, Pittsburgh, Pa.
Room 994—270 Broadway, New York
1215 First National Bank Bldg., Chicago
924 Tuttle Street, Des Moines, Iowa
1224 Praetorian Bldg., Dallas, Texas
614 Rialto Bldg., San Francisco, Calif.

Pittsburgh-Des Moines Steel grandstands are used on all types of athletic fields and for indoor arenas. They are built in standard sections 18 feet long by 10 rows deep, each section seating 120 people. A stand may be any number of sections long by any number of sections deep. Its seating capacity may be increased from time to time, double decked if necessary, and no matter how often enlarged it will always present a neat and finished appearance. A roof may be provided over all or a portion of the stand.

All Steel Grandstands

Patent No. 1,452,467

Note the sturdy construction of the deck and supports—clearly illustrated in the two close-up views. Substantial handrails surround the stand, and may also be installed to divide it into sections.

The wood seat planks supported on cast iron stools are securely bolted down to the deck. Other types of seats are furnished if desired. Aisles, at proper intervals, extend from front to back with walkways along the front or back if necessary. Entrance or exit is accomplished by means of stairs or ramps at the lower end of each aisle, or through wells in the stand.

The steel deck is built to shed water. Hence the space under the stands may be utilized for dressing rooms, toilet facilities, storage, etc. In a number of instances masonry walls have been built along the ends and back so as to totally enclose the space under the stands.

These stands are permanent. They do not weather rot or decay and therefore will not weaken and collapse. Their first cost is low, and they have a high salvage value. Being assembled by means of bolts, they can be dismantled and re-erected at another location — feature not possible with other types of construction. An occasional coat of paint, the only maintenance necessary, keeps them looking new year after year.

Write our nearest office for any additional information you may desire.

Southwest Stands—Penn State, State College, Pennsylvania, Seating Capacity 8160

Marietta College, Marietta, Ohio, Seating capacity 4290
Masonry enclosure—ends and back

Spencer, Iowa, Partially covered stand

West Stands, Waterloo, Iowa, Independent School District, Seating capacity 2200

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Alkalies and Chemical Products Manufactured by The Solvay Process Company

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Boston	Cincinnati	Kansas City	Pittsburgh
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THE PRACTICAL, EASY, INEXPENSIVE ANSWER TO THE DUST PROBLEM

on the Campus, Recreation Fields, Running Tracks, Tennis Courts and Drives

The Solvay Calcium Chloride Treatment is a primary part of the maintenance of the world's most famous tennis courts, such as those at Forest Hills, L. I. This same treatment has also long been recognized by School, Park and Recreational authorities all over the country as the ideal dust-layer for producing smooth, clean surfaces for play areas.

Spread over the athletic field, baseball diamond, track or drive, Solvay Calcium Chloride, a clean, white odorless material, eliminates unhealthy, germ laden dust and prevents grass and weed growth; compacts and binds the surface. It may be applied by hand by unskilled labor—no special equipment is required at all.

The cost of applying Solvay Calcium Chloride is extremely low. An application once or twice a season on gravel and dirt surfaces is all that is needed to give clean play areas. Write today to the above address for complete information, prices and booklet.

Cinder Road Through Campus of Smith College Kept Compact and Dustless with Solvay Calcium Chloride

SOLVAY

TRADE MARK REG. U. S. PAT. OFF.

Calcium Chloride

Baseball Diamonds	Roads, Drives, Walks,
Parking Lots	Recreational Areas,
School Yards	Summer Camps, Bridle
Athletic Fields	Paths

SUPERIOR SEATING CO., INC.

105 West 40th Street, New York

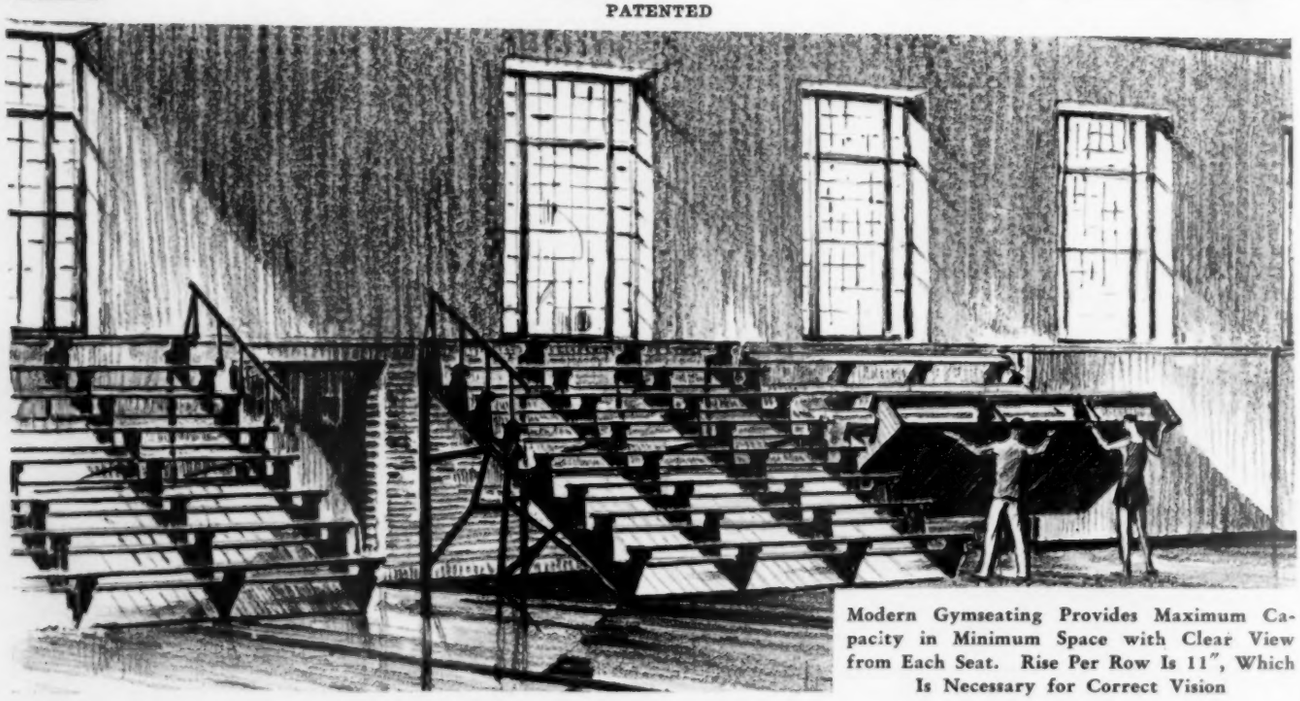
GYMSEATING

Advantages of Adamson "Gymseating"

1. **CORRECT VISION—11-inch rise between all rows for clear view, and to make standing unnecessary. Every seat a good seat.**
2. **Absolute safety to spectators and operator. Guard Rails at open ends.**
3. **Quick and easy manipulation with the least amount of energy.**
4. **Absence of all mechanical devices, such as coil springs, gears, pulleys, cables, worm screw drives, etc. (Self-counterbalanced).**
5. **Adaptability to various conditions of architectural design.**
6. **Face panel always protected. It never touches the floor.**
7. **Construction of "Gymseating" is exceptionally rugged, and is of the best materials available, to insure long life without repair.**
8. **All parts of stand easily accessible for cleaning.**
9. **Finish comparable with that used on School furniture.**

Send full particulars for further information

PATENTED



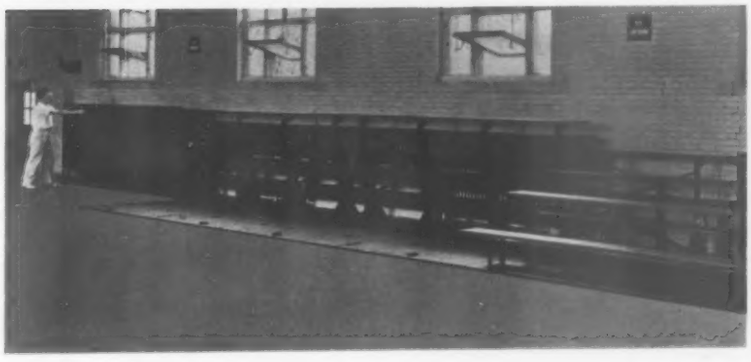
Modern Gymseating Provides Maximum Capacity in Minimum Space with Clear View from Each Seat. Rise Per Row Is 11″, Which Is Necessary for Correct Vision

UNIVERSAL BLEACHER CO.

Manufacturers of Folding Gymnasium Stands;
Portable Bleachers and Portable Grandstands
606 So. Neil Street, Champaign, Illinois

FOLD-A-WAY GYMNASIUM STANDS

Universal Fold-A-Way gymnasium stands are designed to provide comfortable, roomy seating that may be folded away in less depth and considerably less height than similar stands. They are completely counterbalanced for one man operation. Fold-A-Way stands provide permanent seating for the gymnasium, yet may be folded out of the way in a few minutes' time and require no storage space.



Installations *

Andover, Mass. Jr. High School
Bellport, L. I. N. Y. High School
Bismarck, N. Dak. High School
Caldwell, Idaho High School
Immaculata High School, Chicago
St. Bernard School, Chicago
Y. M. C. A., Daytona Beach, Florida
Peabody High School, Pittsburgh, Pa.
Beaty Jr. High School, Warren, Pa.
Rumson, N. J. High School
Carver Jr. High School, Tulsa, Okla.
Weedsport, N. Y. High School

** Partial list of recent installations.*

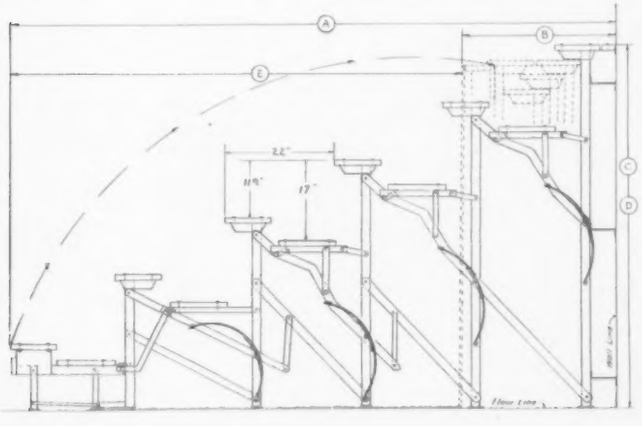
More Gymnasium Space

When the stands are folded compactly against the wall and shielded with highly finished plywood cabinets, many additional square feet of floor space are made available for physical education classes, basketball practice sessions on cross-courts and other activities requiring a larger space than that of an ordinary basketball court.

It costs quite a bit to build in stationary concrete seats that are used on an average of not more than thirty hours during the school year. The valuable floor space that these concrete seats occupy costs about five dollars per square foot and this space can be made available for other activities by installing Universal Fold-A-Way stands. This additional floor area will be used in some instances, more than a thousand class hours during the school year.

Convenient—Yet Inexpensive

In addition to providing more floor space, Universal Fold-A-Way gymnasium stands cost less to install than any other type of permanent seating. The actual cost of equipping a gymnasium with up-to-date seating is less than fifteen cents per person seating capacity per school year or less than the cost of supplying each student with lead pencils during the same period.



Covered Top

The seat boards nest together in the folded position to form a complete cover over the top of the stand which prevents basketballs, handballs and other objects of this kind from becoming lodged back of the stand. Heretofore it has been necessary to unlock and lower the stands, particularly on the larger sizes, in order to retrieve these objects. This is still necessary on some makes of folding stands unless a wire canopy is furnished at an added cost. The wire canopy will bend and twist out of shape under the force of basketballs bouncing against it.

Easy Access for Cleaning

The cabinets on Fold-A-Way stands fold separately thereby allowing complete access underneath for oiling the various moving parts and for cleaning up the paper, gum wrappers or other fire hazard that might otherwise be inadvertently left to accumulate beneath or behind the stands.

Proper and Uniform Rise Per Row

The rise per row on Fold-A-Way stands is 11½ inches which means that the sight line of one row of spectators is 11½ inches above the sight line of the row directly below them, assuring perfect vision for every spectator on every row. The rise per row is uniform for all rows and the seat spacing front to back is uniform, providing the greatest safety for the spectators when walking up and down on Fold-A-Way gymnasium stands.

Other Fold-A-Way Features

Some of the other more important improvements in folding grandstand design embodied in the Fold-A-Way stand include direct support to the floor under each row, adequate cross-bracing to take care of sway forces, easy access to radiators located behind the stands, and uniform section lengths.

TABLE OF SIZES

Rows High	A Depth Opened	B Depth Closed	C Height in Use	D Height Closed	E Space Gained
3	4′ 8″	1′ 8″	3′ 0″	3′ 0″	3′ 0″
4	6′ 6″	1′ 11½″	3′ 11½″	3′ 11½″	4′ 5½″
5	8′ 4″	2′ 3″	4′ 11″	4′ 11″	6′ 1″
6	10′ 2″	2′ 6½″	5′ 10½″	5′ 10½″	7′ 7½″
7	12′ 0″	2′ 10″	6′ 10″	6′ 10″	9′ 2″
8	13′ 10″	3′ 1″	7′ 9½″	7′ 9½″	10′ 9″
9	15′ 8″	3′ 5″	8′ 9″	8′ 9″	12′ 3″
10	17′ 6″	3′ 8″	9′ 8½″	9′ 8½″	13′ 10″

Estimates—Send us dimensions of spaces available for gymnasium stands or a floor plan together with the size playing floor to be used.

Specifications—We will gladly furnish typical specifications for use in obtaining competitive bids.

WALLACE & TIERNAN COMPANY, INC.

Manufacturers of Chlorine and Ammonia Control Apparatus

Main Office and Factory: Newark, New Jersey

"SWIM IN DRINKING WATER"

Boston, Bridgeport, Buffalo, Charlotte, Chattanooga, Chicago, Cleveland, Columbus, Dallas, Denver, Detroit, Indianapolis, Jacksonville, Kansas City, Knoxville, Lexington, Los Angeles, Madison, Minneapolis, Oklahoma City, Philadelphia, Pittsburgh, Roanoke, San Francisco, Seattle, St. Louis, Syracuse, Washington, D. C.

Wallace & Tiernan, Ltd., Toronto, Canada
Wallace & Tiernan, Ltd., Winnipeg, Canada
Wallace & Tiernan, Ltd., Montreal, Canada
Wallace & Tiernan, Ltd., London, England

With the school swimming pool firmly established as a part of the physical training program, efficient sterilization is necessarily important. School executives can do no better than to follow advice given in the Report of the Joint Committee of the American Public Health Association and the Conference of State Sanitary Engineers. This report, in part, states: "From all available information, the addition of chlorine either as a gas or water solution by use of proper apparatus is today the most satisfactory method of pool disinfection." Chlorine alone gives the residual penetrating action for the complete protection of bathers at every point in the pool. More than 3000 swimming pools of the United States today rely on W&T chlorinators for positive disinfection.

"Swim in Drinking Water"

W&T Type MSP Chlorinator—For the majority of medium-sized pools, this type machine is most suitable. It not only accurately controls the small amounts of chlorine but gives a feed range sufficiently wide to include all changes in bathing loads. All control parts are on the outside and a removal hood makes complete inspection possible at any time. Its simple construction and operation are readily understood by the practical pool attendant.

W&T Type MSP Chlorinator for the Sterilization of Average Sized Swimming Pools

W&T Type MSV Chlorinator is the efficient sterilizer for large pools, having heavy bathing loads. Simplified design and sturdy construction have combined to make unusual performance records for this type of chlorinator. Of more than 3000 installed since the first went into service thirteen years ago, not a single machine has ever worn out. A survey of repair costs indicates average annual maintenance charges do not exceed one per cent of the initial investment.

W&T Ammoniator — Used with a W&T chlorinator for the production of chloramine. Chloramine is the most advanced method of pool sterilization. High chlorine residuals can be carried without objectionable tastes or odors. Chloramine rids filters and pool water of algæ growths—a real saving in operating costs. Savings of as much as $200 a season have resulted from the use of chloramine. W&T Ammoniators are made by the same rigid production standards and excellence of material as W&T chlorinators. W&T Ammoniators differ only in the special materials required for the efficient metering of ammonia.

W&T Ammoniator Used with a W&T Chlorinator to Produce Chloramine

W&T Chlorine Comparator—Swimming pool chlorination can only be controlled accurately, economically and safely when regular use of the orthotolidin test is made. The W&T Hellige Chlorine Comparator meets all requirements for a rugged, portable, accurate testing outfit. Its operation is so simple that accurate determinations of residual chlorine require only a moment's time and no specialized knowledge.

At Your Service—We are prepared to study any problems covering the sterilization of swimming pools and a nation-wide service organization is responsible for satisfactory performance of W&T equipment.

Current literature on the sanitation of swimming pools is available on request.

SECTION VI
CLASSROOM—COMMERCIAL DEPARTMENT—LIBRARY

BETTER CLASSROOM PROVISIONS FOR HIGH-SCHOOL WORK

BY N. L. ENGELHARDT

Professor of Education,
Teachers College, Columbia University

Drawings by W. K. Harrison and J. André Fouilhoux, Architects, Rockefeller Center, New York City

TRADITIONAL demands, as well as financial limitations, have restricted the size and defined the character of high-school classrooms in the past. The size has been determined very largely on the basis of 18 square feet per student. The special teaching equipment has consisted of ample blackboard space, limited bulletin board space, a bookcase, and infrequently another cabinet. In the past the average high-school classroom has not been made attractive, nor has it been made to fit the traditional needs of the teacher. Very frequently it has been thought of as a place to house students rather than as a working laboratory or an attractive living environment. Without doubt, the nature of our schoolhouses will change in the near future. The vast improvement in curriculum development which has taken place in this country will most certainly have its effect upon the school plant. Educators and architects should be anticipating this change. In the meanwhile, it is well to project the next steps in classroom planning.

A Classroom That Fits the Teacher's Need

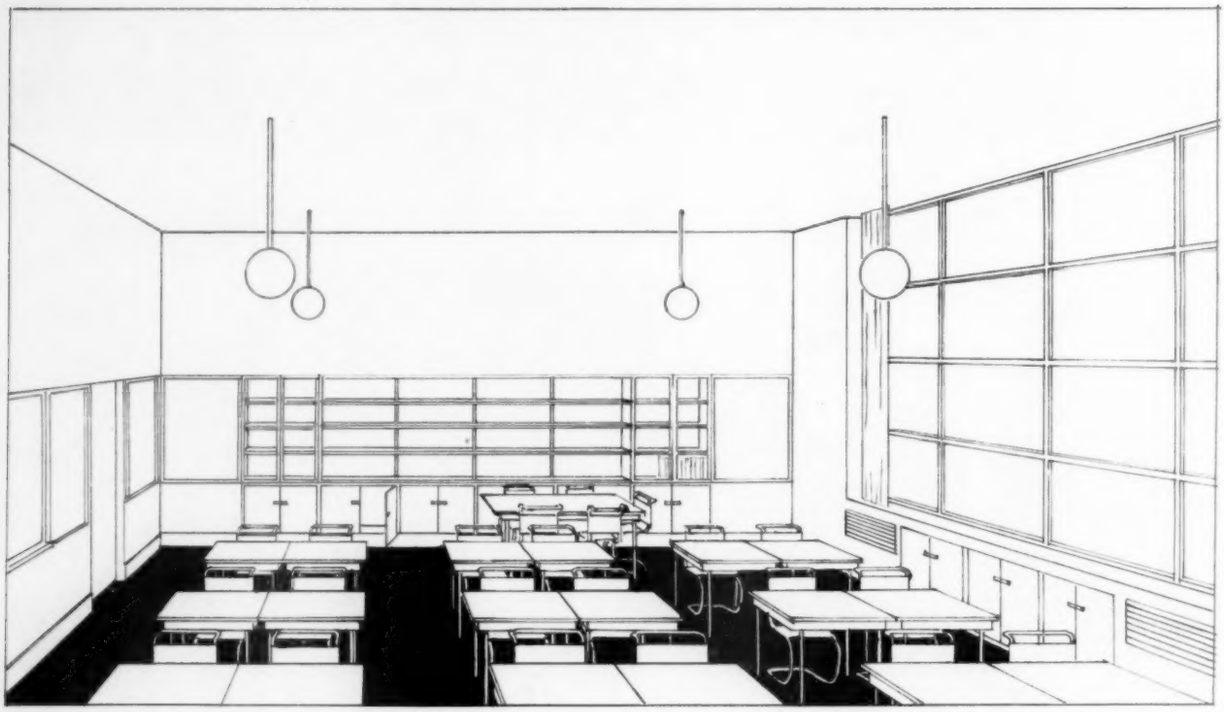
The three diagrams which accompany this article may well be considered as three stages in this planning. Diagram 1 represents a classroom which more nearly fits teachers' needs than the large number of classrooms which have been incorporated in high schools in the past. The floor plan shows students' tables and teacher's desk, with a work table or reading table at the rear of the room. At the front of the room, as will be seen on the front elevation, appears a cabinet with files below, and a blackboard, with a spacious cork display board above and chart cases below. These chart cases are hinged at the bottom and carry a metal framework on the interior which holds in place large display materials which are needed from time to time in all types of high-school classes today. The files may be used for curriculum materials which are in preparation by students and teacher. A radio loudspeaker is also indicated. At the rear of the room will be found display boards and bookcases with shelving of sufficient amount to carry an ample collection of books for any special subject which is being taught. Underneath the bookcases are cupboards for the storage of teacher and student material. The perspective from the front of the room, as shown in Diagram 1, illustrates a method of handling the window side of the classroom. Here a sunboard is provided above radiators, and between radiators again are found special storage cabinets. The cost of the provision made in this room for the assistance of the teacher will be offset many times in the course of the life of the building by the higher efficiency of the teacher and the better morale of the student body. The room represented here can be used for many different types of high-school class work.

A Language Classroom

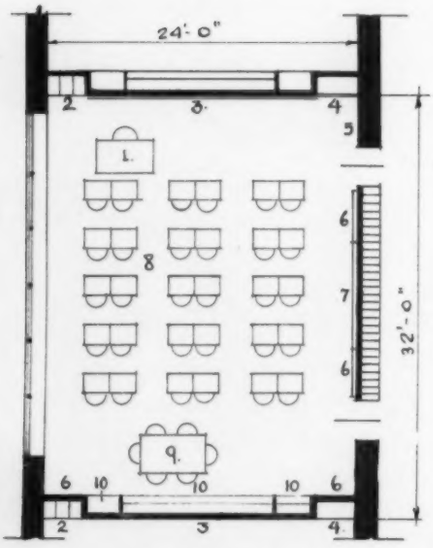
The language classroom outlined in Diagram 2 proceeds somewhat beyond even the provisions made in Diagram 1. It is recognized that language, whether it is foreign or native, represents the expression of the people. This room provides for expression because it has a platform at the front of the room and up two risers above the floor level itself. The platform may be used for many types of speech activities associated with the learning of a language. It may be the reproduction of a drama, or the give and take of a debate. Because of its ample size, the platform in no way interferes with its use for other types of activities, such as group conferences and reading opportunities.

It will be noted from the floor plan of Diagram 2

DIAGRAM 1
A CLASSROOM WHICH FITS TEACHER NEEDS



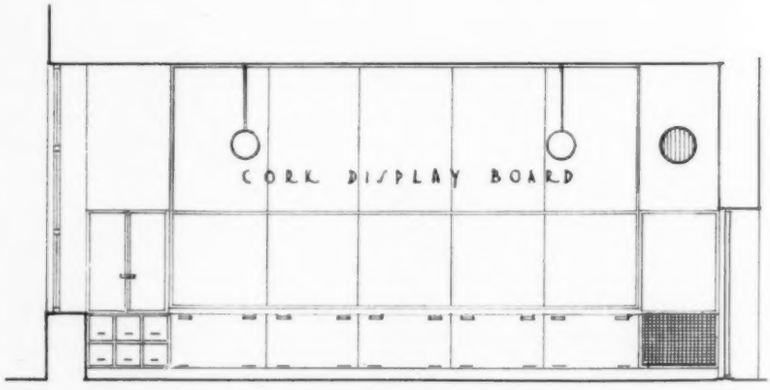
PERSPECTIVE FROM FRONT.



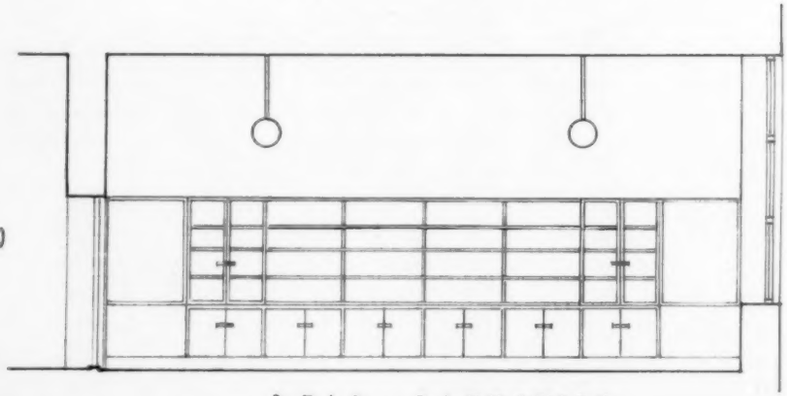
PLAN.

SCALE 0 5 10 15 20

1. TEACHER'S DESK
2. FILES (CABINET OVER)
3. CHART CASES (BLACKBOARD OVER)
4. VENT DUCT.
5. BULLETIN BOARD
6. DISPLAY BOARD.
7. BLACK-BOARD
8. STUDENT TABLES.
9. WORK TABLE.
10. BOOK CASES (ENDS GLAZED).



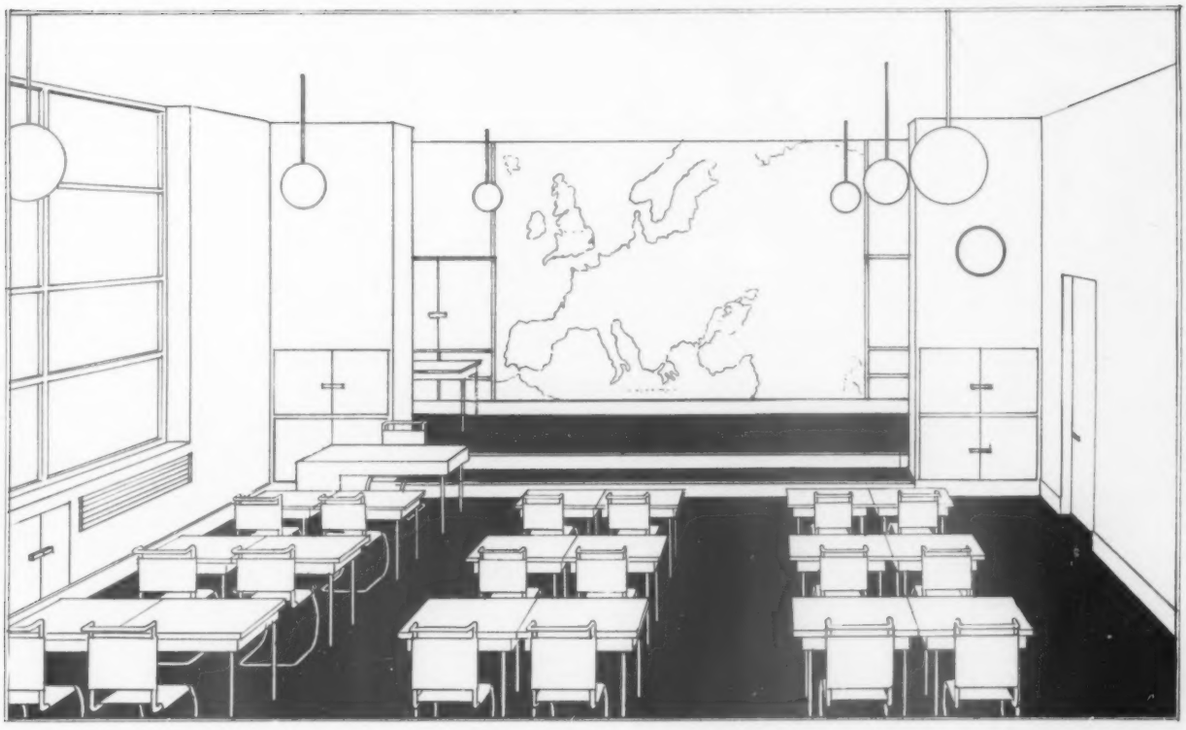
FRONT ELEVATION



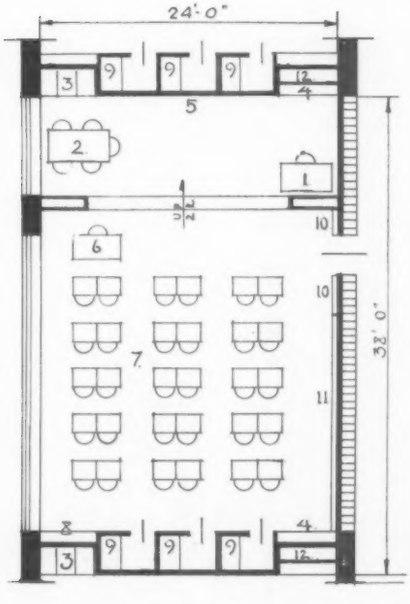
REAR ELEVATION.

SCALE 0 5 10 15 20

DIAGRAM 2
PROPOSED LANGUAGE CLASSROOM



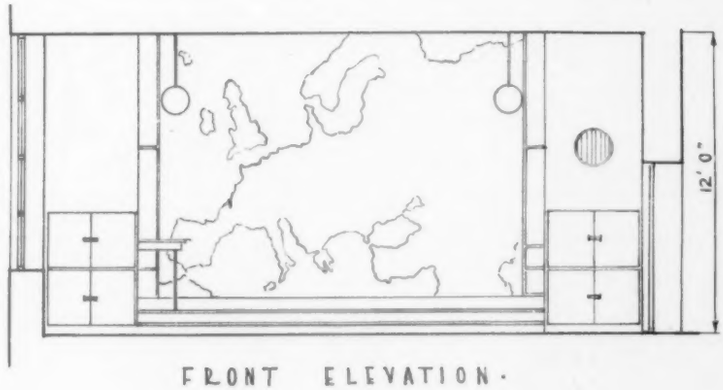
PERSPECTIVE FROM REAR.



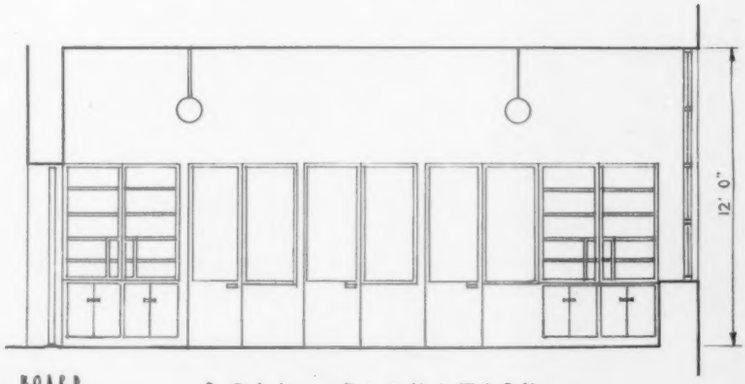
PLAN

SCALE — 0 5 10 15 Ft

1. TEACHER'S DESK.
2. WORK TABLE
3. FILES (CABINET OVER)
4. CABINET
5. MAP
6. TEACHER'S TABLE
7. STUDENT TABLES.
8. BOOKCASE
9. GRAMOPHONE BOOTH.
10. BULLETIN BOARD
11. BLACKBOARD.
12. DUCT
13. STUDENT CABINET.



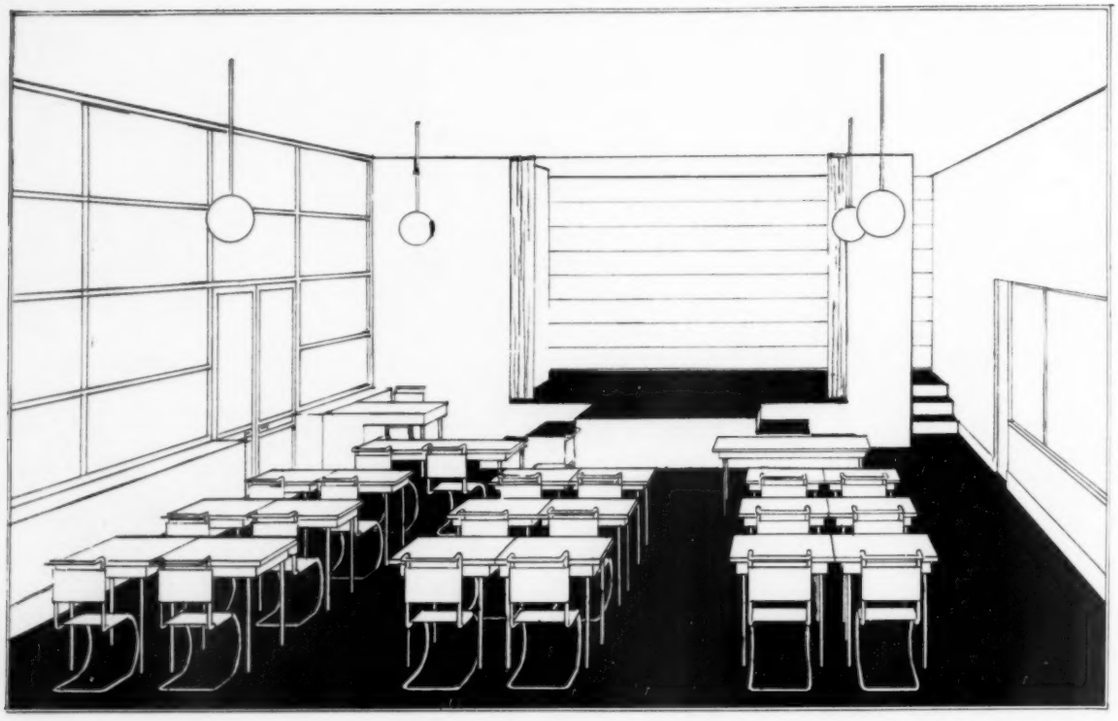
FRONT ELEVATION.



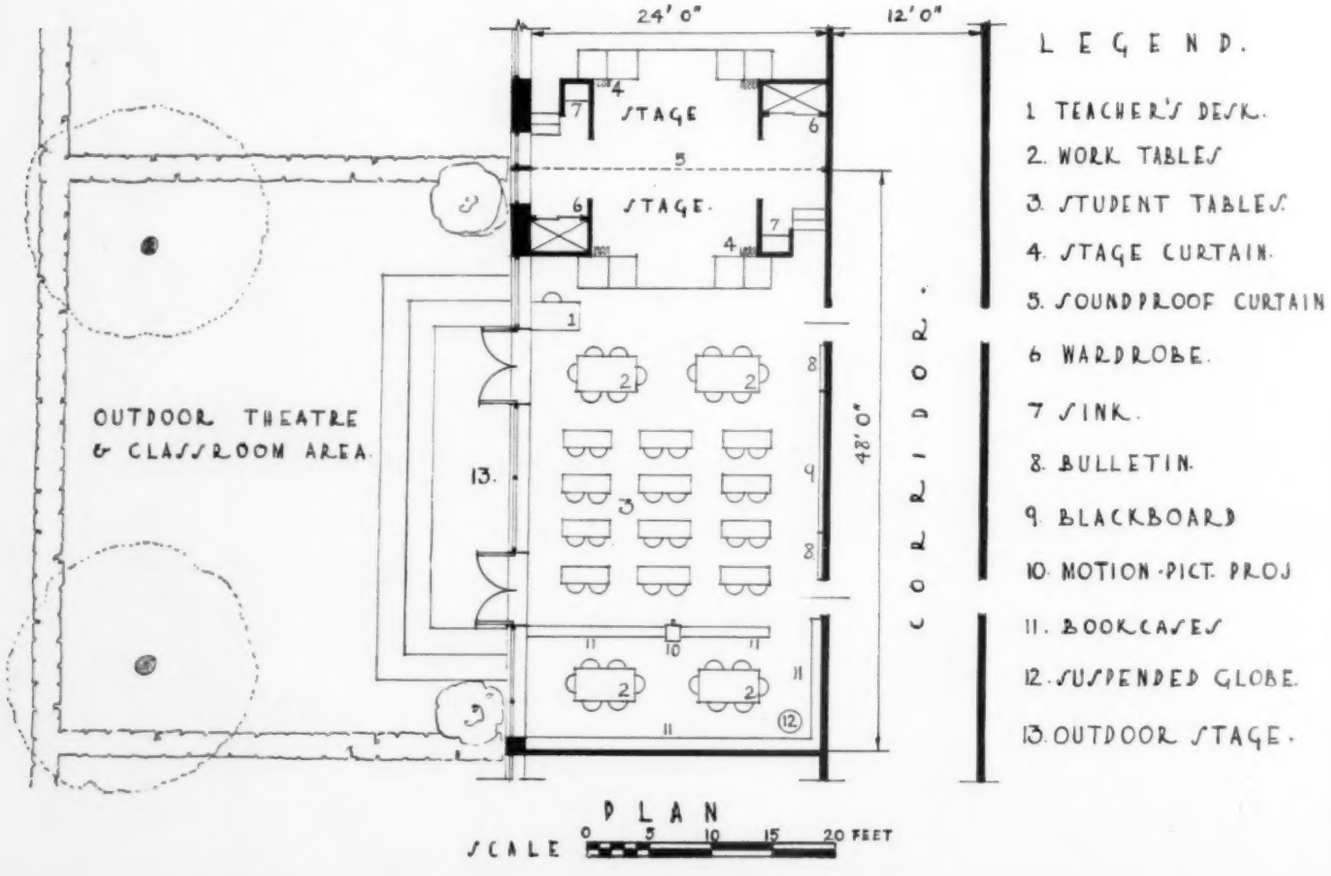
REAR ELEVATION.

SCALE OF ELEVATIONS.
5 10 15 Ft.

DIAGRAM 3
PROPOSED ENGLISH CLASSROOM



PERSPECTIVE FROM REAR.



PLAN
SCALE 0 5 10 15 20 FEET

that small booths have been arranged at the back of the room for gramophone or linguaphone opportunities for language learning. Bookcases and storage cabinets have also been provided. Files for curriculum materials are also included in the general plan. The architects have produced an unusual and very pleasing effect in this room by placing cabinets for student materials, or for teacher supplies, on either side of the risers to the platform. This room may be adorned in the spirit of the land whose language is being taught. The large space in the front of the room may be used to carry the world territories within which the language to be taught is spoken. Other types of provision should be made in the room which would enlarge the scope of language teaching and make for a real camaraderie among those who are utilizing in common the language taught.

An English Classroom

Diagram 3 is a good illustration of the kind of classroom facilities which result when administrators and teachers pool their thinking in planning. This English classroom provides for the types of activities which are naturally associated with English instruction. The plan shows how two English classrooms might be planned en suite. The outstanding features of this room are the stage, the work and reading room to the rear, and the outdoor theater opening off the room itself.

There are two bookcases in the rear of the room. There is one piece of blackboard 4 x 10 feet, and two pieces of bulletin board 4 x 4 feet on the corridor side of the room. Space is provided in the front of the room for statuary. A four-section movable blackboard is part of the equipment. The proscenium opening is 13 feet wide, and there are two entrances to the stage—one from each side. Side walls are provided for murals of appropriate design. There is space for appropriate pictures in this room and the reading room. The room is 24 x 36 feet. The stage is 10 feet in depth. There are two dressing rooms, each 4 x 6 feet, and a storage room at the rear of the stage. The dressing rooms are so arranged and lighted that they may be used by the students as conference rooms, if necessary. There is a corridor entrance to the stage.

This room is provided with equipment for sound pictures and with a connection to a central radio system. The front and rear elevations and the perspective from the rear are shown. It is readily seen that the teachers planning this room have felt the need for stimulating individual growth, for giving a maximum of opportunity for expression in various areas associated with English, and have sought to provide an environment which will permit of the reproduction of outstanding English contributions to the social inheritance.

These three sets of diagrams may well afford the basis for stimulating other administrative and teacher groups to better classroom planning. The future changes which will be found in school buildings will be adjustments to classroom need, brought about by teacher and administrative interpretation of the curriculum and their determination of the space requirements which will satisfy those needs.

CLASSROOM FACILITIES FOR THE PROGRESSIVE SCHOOLS

BY J. W. WRIGHTSTONE

Institute of School Experimentation,
Teachers College, Columbia University

Fourth Grade Library—Library Table and Moveable Chairs Facilitate Self-Directed Work

Photographs by courtesy of the Bronxville, N. Y., Public Schools

A MAJORITY of persons who plan school buildings follow the advice, "Be not the first by whom the new is tried nor yet the last to lay the old aside." Progressive curricula in the elementary and, recently, the secondary school have changed from the traditional assignment-recitation technique to an activity program approach. This fact demands that the facilities of the classroom shall be adapted to aid in the attainment of the objectives of the new education. The old fixed seats, uniform textbooks for all pupils, and few pieces of academic equipment, have given way to new ideas of design and planning.

The progressive classroom and its various coordinate aspects, such as the library, gymnasium, art and music rooms, have changed considerably during the past ten or fifteen years. When progressive education was in its infancy, John Dewey had to design his own facilities because he was unable to find any adequate equipment for a classroom which would provide for active learning rather than passive memorization and recitation of lessons. What are some of the values which the progressive schools attempt to attain? How can the elementary school classroom be coordinated with the progressive curriculum? How can the secondary school classroom be coordinated with the progressive curriculum? What is the relation of the progressive curriculum to classroom facilities? These are pertinent questions of school construction which must be asked and answered. The values, or objectives, of modern progressive education may be classified under general and specific values. The general values are beauty, freedom, and quiet. The specific values are activity, individualization of instruction, socialization, opportunity for independent and guided pupil investigation, creative expression in the language arts, the graphic, plastic and industrial arts. These are some representative objectives by which progressive education attempts to lead children into a more abundant life in the classroom.

To Attain Freedom and Quiet

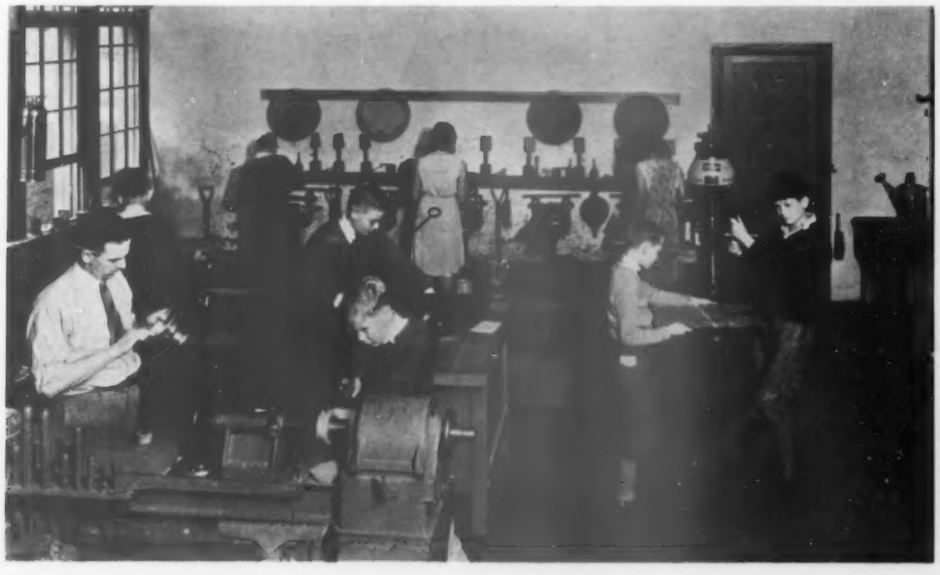
In recent years there has been a change in educational philosophy. This is reflected in the buildings which house the modern schools. To provide freedom, the rooms are made as large as possible. The size of the class group is restricted in order that there may

Third Grade Weaving Rug—Within the Classroom There Should Be Sufficient Space for Books, Class Materials, Bulletin Boards, and Individual Lockers

be plenty of space for every activity. There are no fixed desks or chairs, and pupils are allowed a maximum possible freedom of movement. To attain quiet, the classroom and library are planned so that small groups are segregated for their several activities. Acoustic plaster, rubber tile, draperies and other classroom equipment are used so as to diminish sound which otherwise would pass from one classroom to another. In the layout and planning of the school the parts of the building dedicated to quiet activities are separated from those parts where noisy activities are housed.

Special activities of the curriculum may best be carried on in special classrooms for arts, music, manual training, and the like. Small activity rooms for group activities like committee meetings, conferences, and individual work adjoin the regular classroom in these progressive schools. The use of libraries and auditoriums as aids in developing and exhibiting units-of-work and other activities has made these rooms integral parts of every comprehensive learning experience.

Within the larger classroom itself there must be sufficient space for books, bulletin boards, the storage of class materials, and individual lockers where children may store their own materials. The furniture must be moveable and flexible so that it can easily be rearranged for any particular purpose of instruction. A coordinate activity room such as the library must include alcoves for special study and particularly for investigation which groups from various classrooms may wish to conduct.



Junior High General Shop—Special Activities May Best Be Carried on in Special Classrooms

A Well-Designed Progressive Kindergarten Room

One progressive kindergarten room in Chicago is designed especially for beauty, freedom, and socialization. Its space equals that of two regular classrooms. There is a wardrobe for pupils' and teachers' cloaks, a drinking fountain, and play equipment. The room combines attractiveness with utility. There is a decorative fireplace in the center of one end wall, flanked on each side by open bookshelves, above which are cork board panels which may be used for pictures or pupil exhibits. The floor is laid with rubber tile in variegated shades of green, blue and yellow. The furniture and wood trim are enameled. The room deviates from type in two respects—the sun bay and the folding partition. A circular seat forms a radiator enclosure within the sun bay, and in the middle of this seat there is a flower-box at windowsill height. A terrazzo pool for fish is in the center of the bay. The kindergarten may be divided into a playroom and a project room by a folding partition which, when closed, is recessed in a niche in the corridor wall. The partition contains a small communicating door permitting access to each room.

The Progressive Curriculum in Secondary School Classrooms

A survey of the regular secondary school classrooms in progressive school systems reveals that they have not been adapted for the activity program as well as the elementary school classrooms. However, the theory of the activity program is being incorporated more and more into the progressive secondary school curriculum.

How can the secondary school classroom be coordinated with progressive curriculum? One finds that the same general principles and values hold for the secondary school as for the elementary school. The practices in the new secondary schools are beginning to place more and more emphasis upon the specific values of pupil activity, individualization and socialization of instruction, pupil investigation and research, and creative expression in the language arts, graphic, plastic and industrial arts.

Subconsciously, classroom environment has a marked influence on the attitudes, conduct and relations of both pupils and teacher. If the pupils have to sit on benches and desks which are secured to the floor and which require them to sit erect, the teacher may be influenced toward speech-making activities. The growth of the unit assignment, including the Morrison unit, problem-project method, and integrated activity unit-of-work, has recently been surprisingly large, according to Roy Billett, who made studies for the National Survey of Secondary Education. Unit assignment teaching in the social studies, natural sciences, and language arts, for example, requires adequate classroom facilities, a small group conference alcove, and flexible furniture.

The Essential Equipment

The progressive secondary school classroom, to provide for flexible use in a variety of activities, should be equipped with moveable tables and chairs. In addition to science rooms, other progressive classrooms have tended to become workrooms demanding a laboratory setting, laboratory treatment and laboratory supplies. Along the walls adequate bookcases and lockers are built in; and on the walls are cork bulletin boards. The modern classroom contains a radio outlet and floor-plugs to be used for lantern, projector, or portable motion-picture machines. The progressive room is equipped with shelves and exhibit cases for displaying models, drawing tools and equipment for expression in many media. On the tables a number of current magazines and periodicals will be placed, along with an unabridged dictionary. The up-to-date social studies classroom, for instance, has on its bookshelves an encyclopedia, and statistical reference material, such as The World Almanac, Reader's Guide to Periodical Literature, and Who's Who in America. School atlases, historical and geographical, are indispensable, and maps, both mounted and of the roller-type, are at hand for easy reference. Similar materials are available in classrooms dedicated to other studies, especially the natural sciences and language arts.

In Summary

To summarize, then, the relation of the progressive curriculum to classroom facilities is of utmost importance. Without such adequate facilities as moveable furniture, adjoining workrooms and alcoves, bookcases, lockers, drawing equipment, radio outlets, and outlets for picture projection, the progressive elementary and secondary school cannot attain most effectively those intangible values of beauty, freedom, activity, individualization and socialization of instruction, pupil investigation and research, and creative expression in the several arts.

The old conception of the classroom as a place for reciting lessons has changed. The modern and progressive classroom must be a workroom adapted for self-directed group and individual activities. Its environment must truly stimulate and permit the realization of the evolving objectives of a new education. This implies opportunities for the use of relatively new aids to education like the radio and motion picture. The classroom facilities are inextricably part and parcel of a progressive concept of education.

Left:—Senior High Girls with Guinea Pigs—Subconsciously Classroom Environment Has a Marked Influence on Attitudes, Conduct and Relations of Pupils and Teacher

Below:—Getting out "The Mirror." Progressive Secondary School Classrooms Have Tended to Become Workrooms

PROGRAM AND EQUIPMENT FOR FINE ARTS INSTRUCTION

BY ETHELYN HENDERSON

Supervisor of Fine and Industrial Arts,
Board of Education,
Paterson, N. J.

THE accompanying drawings of the art room in Paterson's newest school show the latest layout and equipment, gradually developed from the original regular classroom, to meet the needs of a continuously expanding department.

"Expanding" should be understood here to mean becoming increasingly comprehensive, developing from the old academic "drawing" to the present all-embracing reaction of the child to his entire environment. When this is understood, it will readily be seen that this complete integration means the use of a great variety of media, and space and equipment for making and housing many kinds of materials and models. In a school where there is a separate room and a teacher for each type of craft, the planning is comparatively easy. For example, a room which has been planned previously for clay modeling, pottery or jewelry may be thoroughly equipped for any one of these subjects.

To Attain Flexibility

The Paterson situation calls for an entirely different set-up. Having been given a free hand in the development of this department, the supervisor was free to plan the work of the department to fit the organization of the school system. This was achieved by avoiding formalism, by keeping the work absolutely flexible, this making it possible for the teacher to let the art function in a normal way.

It would be difficult to predict the nature of specific projects at any given time. Since the objectives of the work are avowedly appreciation, orientation, and creative expression, with skills and technics as a necessary concomitant, although secondary, it follows that an art room must afford opportunity for the use of many media, rather than for the perfection of a few specialized technics.

The proportions of the room have been necessarily governed by the proportions of the single units (two being allowed for the art room). These proportions made the task of planning the layout and equipment of the room difficult. In the long run, however, they lend themselves very well to the purpose for which the room must function.

Equipment supplied for such general use includes a folding ironing board, an alberene sink and cabinet combined, with three basins, shelf of same material above for paints, space for two-plate gas burner and zinc-lined cabinets below, to take care of paints, brushes, and other materials which might soil or dampen wood, two movable clay bins and cabinets containing divisions of different sizes and proportions, and shelf spaces to take care of the work of twelve to fourteen classes (the number coming to the art room).

The Cabinets

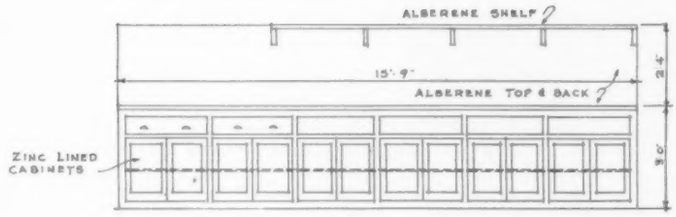
Cabinet C was planned to function as a division between the classroom proper and the sinks and other such equipment, and at the same time furnish space for zinc-lined lockers on one side; and on the other, cork board for display, together with a space for three-dimensional objects above bins which house materials that come in bulk. Four large tables in this area afford space for modeling or for special projects of any kind.

In the main part of the room, Cabinet A contains three types of display cases. The first, A 1, for three-dimensional objects, has glass doors and shelves. The second, A 2, enclosed in folding glass doors, contains large leaves which swing on a central pivot and offer space for a semi-permanent exhibit of drawings, paintings, textiles, etc. This case was designed originally by the supervisor to supply the need for a display, whether of children's work or of source material, which might be shown readily and as readily removed from sight when no longer needed. It does away with the possibility of disfiguring wall spaces with hastily hung exhibits, which sometimes have a tendency to remain long after their usefulness. Cabinet A 3 is a removable case for displaying flat pieces of any kind. Cabinet A also contains a number of drawers and cupboards of different dimensions and space for drawing boards.

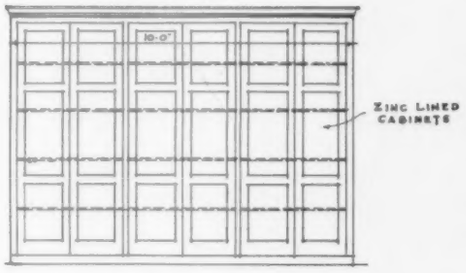
The spaces above the cases afford excellent areas for mural decoration. The arrangement of pupils' tables, both large and small, as shown, is of course arbitrary. Since they are movable, they may be rearranged to suit the type of lesson being conducted.

This room, as previously stated, represents the last stage of evolution from single classroom unit with no equipment.

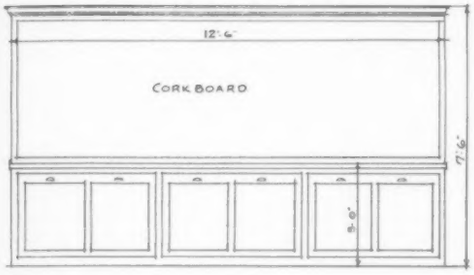
School Number Twenty-five, immediately preceding



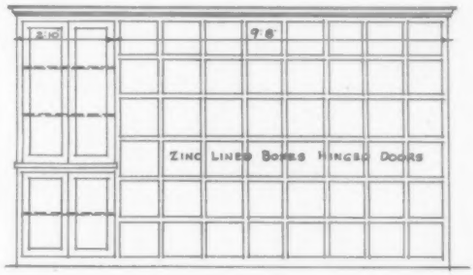
ELEVATION
SINKS & CABINETS



ELEVATION
STORAGE CABINETS



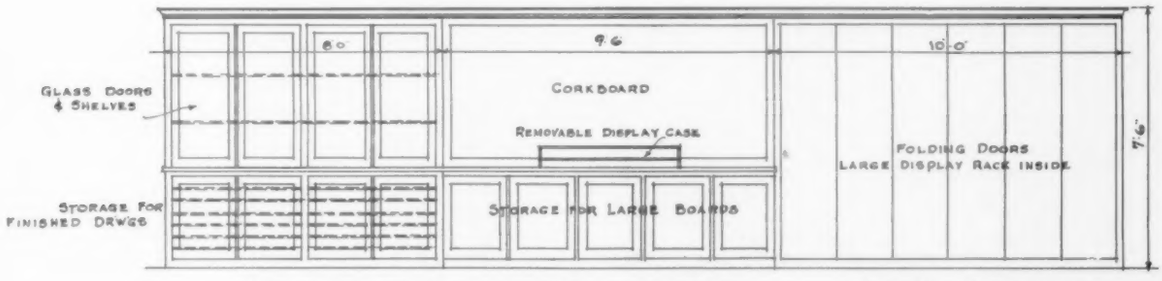
FRONT ELEVATION



REAR ELEVATION

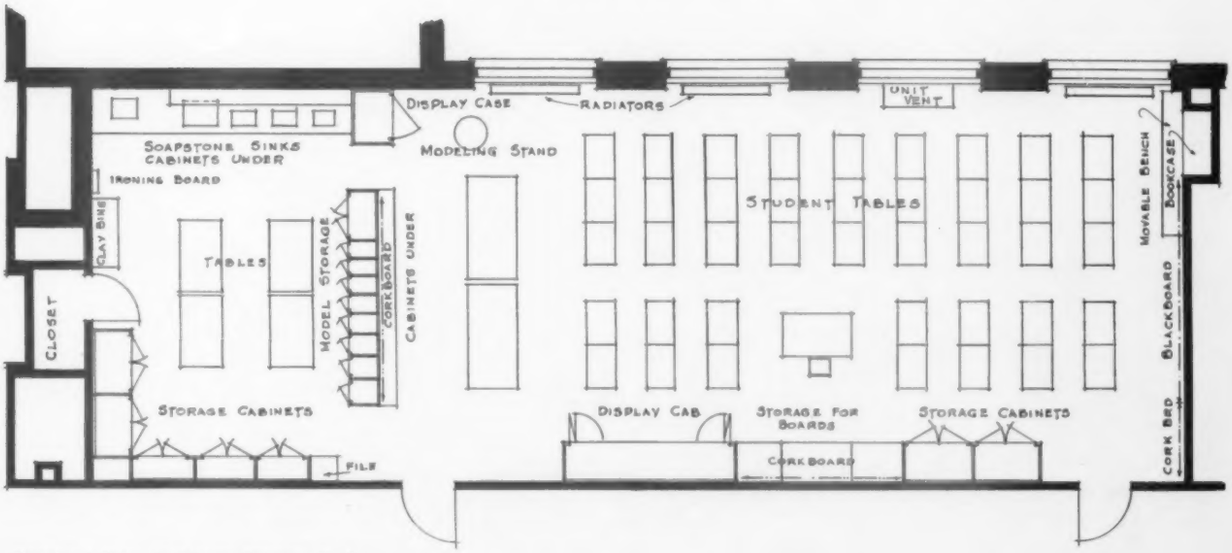
MODEL STORAGE

ELEVATION
STORAGE CABINETS



STORAGE CABINET — BOARD STORAGE — LARGE DISPLAY CABINET

ELEVATIONS



Fanning & Shaw, Architects, Paterson, N. J.

this, has been functioning for the last five years. The layout and equipment are the same as this, with two or three exceptions; namely, the bookcase and bench at the rear of the room for research, the additional closet opening out from the end containing the sink, and the storage room and the display case outside the boundaries of the room itself.

Before recommending that the layout of School Number Twenty-five be repeated in new School Number Eighteen, the supervisor checked up carefully, with the teacher using the room, to see if there were any criticisms. The opinion was that with the two-unit space, and considering the purposes for which the room was to be used, no changes could be recommended.

I have been asked to explain our methods of teaching the arts, particularly the housing projects. These methods have been implied in the foregoing. Perhaps a partial list of the projects will in a measure speak for the methods.

Creative Projects

It should be understood that all types of work are creative in the widest and deepest sense of the word. They represent the children's own reactions to their environment. Some of these are individual, and some group, but this vital reaction holds good in both cases.

Of course, there is the usual creative painting and drawing, which may represent the child's reaction to home, school and civic interests.

Marionettes and puppets furnish an excellent means for creative self-expression, for the enrichment of literature, music, history and all academic studies.

Stage productions for various purposes, such as graduation and assembly programs, obviously afford manifold opportunities for the enrichment of the child's background and for creative expression.

Many interesting things involving clay modeling, pottery, weaving, painting, illuminated lettering, etc., have been done under the inspiration of a study of foreign relations and peace.

The making and decorating of toys, embroidering collars, cuffs, towels, and wall hangings, tie-dyed and batiked handkerchiefs and wall hangings, hooked and rag rugs and block prints are among other articles made when interest arises in them.

Projects in City and Garden Planning

Perhaps the most interesting or at least the most widely discussed project, aside from our work in textiles, has been that of city and garden planning. This grew out of a consciousness of lack of beauty and order in our city, and a realization that from the standpoint of the art department, city planning offered an excellent opportunity for three-dimensional designing, using houses, trees, shrubbery, lawns, etc., as the elements of design. The fact that beauty and function cannot be separated made this distinctly an art problem.

Back-yards, small gardens and parks, reorganization of districts, replanning of a city as a whole, the planning of an ideal city, are among the projects carried out by individuals and groups. Plans for individual homes, for the decoration and furniture of the interiors, and even the making of small models of the houses together with the furniture, involved many technics and media.

A room in which all such projects must be carried out cannot run to specialization, but must afford opportunity for the use of many media as well as space for their storage. It is not offered as a solution for the problems of others, but as a suggestion of a way in which rooms may be developed to suit the needs of departments such as ours, where all such things must be done in one room, under the direction of one teacher.

PLANNING ARTIFICIAL LIGHTING FOR SCHOOL BUILDINGS

Fig. 1. Visibility Meter

BY WALTER STURROCK

General Electric Company,
Nela Park Engineering Department,
Cleveland, Ohio

Fig. 2. Light Meter

THE need for adequate illumination as a connecting link between the eye and education has been emphasized by Prof. H. B. Dates in the 1935 edition of THE AMERICAN SCHOOL AND UNIVERSITY.* Natural daylight is being employed to the extent of its limitation, to provide this much-needed illumination in school buildings. It is a fact, however, that only a very low percentage of the thousands of footcandles of outdoor lighting reaches the interior of a schoolroom. Besides, the footcandle level rapidly drops off as one leaves a window, so that seldom is adequate daylight found on desks which are 20 feet or more from a window. Moreover, on dark, cloudy days the entire room may have insufficient light. Mrs. Winifred Hathaway, in the 1936 edition of this publication,† has given a very complete analysis of the inadequacy and uneven distribution of natural daylight in the usual classroom. Information such as that presented by Mrs. Hathaway should better enable those responsible for lighting our schools to appraise the natural daylight in interiors, and thereby to plan artificial lighting which will at least make up for the deficiency.

A few years ago many classrooms could be found with no provision whatever for artificial lighting, and even within the past year one American city of 300,000 population reported that about 500 of its classrooms, or about one-third of its total number, had no provision for lighting other than the daylight from windows. Such conditions are being eliminated in new construction because school authorities now recognize that although a majority of the classrooms are used only during the daytime, artificial lighting is needed at least from the standpoint of supplementing daylight. But are the provisions that are being made for artificial lighting adequate to maintain a desirable level of illumination, properly distributed throughout the room, with freedom from glare and annoying shadows, so that the lighting will facilitate seeing? The answer to this question involves a consideration of several steps in the design of the lighting system.

1. The building must be adequately wired to permit, without excessive voltage drop, the installation of sufficient lamp wattage to provide the required level of illumination.

2. The outlets should be properly spaced to permit a satisfactory distribution of light from the luminaires.

3. The outlets should be wired so that those over areas near the windows are on different circuits from those over areas away from the window.

4. The lighting units should be not only properly spaced but of such a type to well diffuse the light, eliminating bright glaring spots of direct or reflected light as well as harsh shadows.

5. The illumination level should be adequate to meet the visual requirements found in the various rooms throughout the school building.

6. The lighting system should be well maintained with frequent cleaning of lighting units in order to avoid excessive depreciation from the initial illumination.

Wiring Capacity

When a new school building is erected or when an old building is undergoing major remodeling, the electric wiring system, particularly as regards the feeders, is often designed and installed before any details are available on the type, size or location of lighting units. It is therefore helpful to have some rule or guide to follow in order to insure feeder, as well as branch circuit, adequacy. From this point of view, the Manual of Adequate Wiring * recommends that school buildings be wired to accommodate wattage capacities per square foot as given in Table I. For later reference, recommended footcandles of illumination are also given in this table.

* "Light—The Connecting Link Between the Eye and Education."
† "Room Design and Equipment Requirements for Sight-Saving Classes."

* National Electric Manufacturing Association Publication No. 36-35, dated April, 1936.

TABLE I—RECOMMENDED MINIMUM WATTAGE CAPACITIES FOR SCHOOL-BUILDING INTERIORS

	Minimum Watts Per Sq. Foot	Recommended Footcandles
Auditorium	2.5	10
If to be used as a study room	4.0	20
Art rooms	—	30
Blackboards	—	20
Class and study rooms (watts for blackboards not included)	4.0	20
Corridors and stairways	—	5
Domestic Science	—	15
Drawing rooms	7.0	*30-50
Gymnasium (main floor)	3.0	15
Laboratories	3.0	15
Library (including wattage for convenience outlets)	6.0	20
Lunch room and cafeteria	2.5	10
Manual training rooms (power wattage not included)	4.0	20
Offices	5.0	20
Sewing room (including wattage for convenience outlets)	7.0	*50-100
Sight-saving classrooms	7.0	*30-50
Washrooms and toilets	1.0	5

* Illumination of this order may in some instances be provided from a general lighting system. In other cases, it will be found more economical to provide a combination of general lighting plus supplementary. Direction of light, diffusion, eye protection, study of direct and reflected glare, as well as elimination of objectionable shadows, are all vitally important and must be considered.

Location of Outlets

Before a complete wiring system can be installed, careful study must be given to the location of outlets, so that a satisfactory distribution of illumination will be obtained. The general rules to follow in locating the outlets are: (1) the spacing distance between outlets should not exceed 1½ times the distance from the bottom of the lighting unit (usually at least 18 inches below the ceiling) to the desk top or work plane; (2) the distance between the outlets and the side walls should not exceed one-half the spacing between outlets, and in those cases, such as in laboratories and manual training shops where desks or work-benches are close to the side wall, this distance should not exceed one-third the spacing. By applying these simple rules, the actual spacing distance and location of outlets can be found for rooms of various sizes and shapes, even though the type of lighting unit is still unknown. If, however, it is definitely known that some form of indirect luminaire rather than a direct type will be installed, the maximum spacing between outlets may be increased about 2 feet over that obtained by applying the rule, and the distance from

FIG. 3. TYPICAL CLASSROOM 23 X 30 FEET WITH 13-FOOT CEILING HAVING SIX TOTALLY-INDIRECT LIGHTING UNITS SPACED ON 10- X 12-FOOT CENTERS

The units will accommodate lamps of either 300- or 500-watt size, the former providing an average in service of 11 footcandles, and the latter 19 footcandles

the outside outlets to the wall increased by 1 foot.

To illustrate the application of the spacing distance rule, we can consider a typical classroom having dimensions of 22 x 32 feet with a ceiling height of 12 feet. In this case direct types of lighting units could be located 8½ feet above the desk tops, which are assumed to be 2 feet above the floor. The maximum allowable spacing is 1½ times 8½ feet, or approximately 13 feet, and the permissible distance from the walls is about 6½ feet. Since the room is 22 feet wide and 32 feet long, the actual spacing becomes 11 feet between outlets, both lengthwise and crosswise, with outlets 5½ feet from the side walls and 5 feet from the end walls. In other words, two rows of three outlets each should be used, and the spacing of outlets comes well within the allowable limits for an even distribution of illumination. If indirect luminaires were chosen for this typical classroom, the maximum allowable spacing between them as computed from the rule would be about 15 feet. But since the room is 32 feet long, three outlets per row are still required in order not to exceed the allowable limit. On the other hand, in a room which is only 28 feet long with a 12-foot ceiling height, it would be satisfactory to use two outlets per row, equipped with indirect luminaires, as this is within the permissible spacing limit, to obtain a fairly even distribution of illumination. In this case, a room 22 feet wide and 28 feet long would have four outlets with the units 11 feet apart across the room and 14 feet apart lengthwise. Surveys indicate that most classrooms are 30 to 36 feet long, so that in general six outlets instead of four are required. Figs. 3 and 4 show two classrooms of the usual size, each of which employs six indirect units to provide an even distribution of illumination. Table II gives the illumination levels obtained from typical classrooms having six outlets equipped with lamps of various sizes placed in enclosing globes and in indirect lighting units.

TABLE II—ILLUMINATION OBTAINED IN SERVICE IN TYPICAL CLASSROOM INSTALLATIONS

Type of Lighting Unit	Size Lamp Watts	Footcandles Obtained from 6 Outlets Properly Spaced in Rooms Having Following Dimensions		
		20 x 30	22 x 33	24 x 36
Direct lighting....	200	9	7½	6
Enclosing globe ..	300	14	12	10
Indirect lighting..	300	11	9½	8
	500	19	17	15
	750	29	25	21
	1000	40	35	31

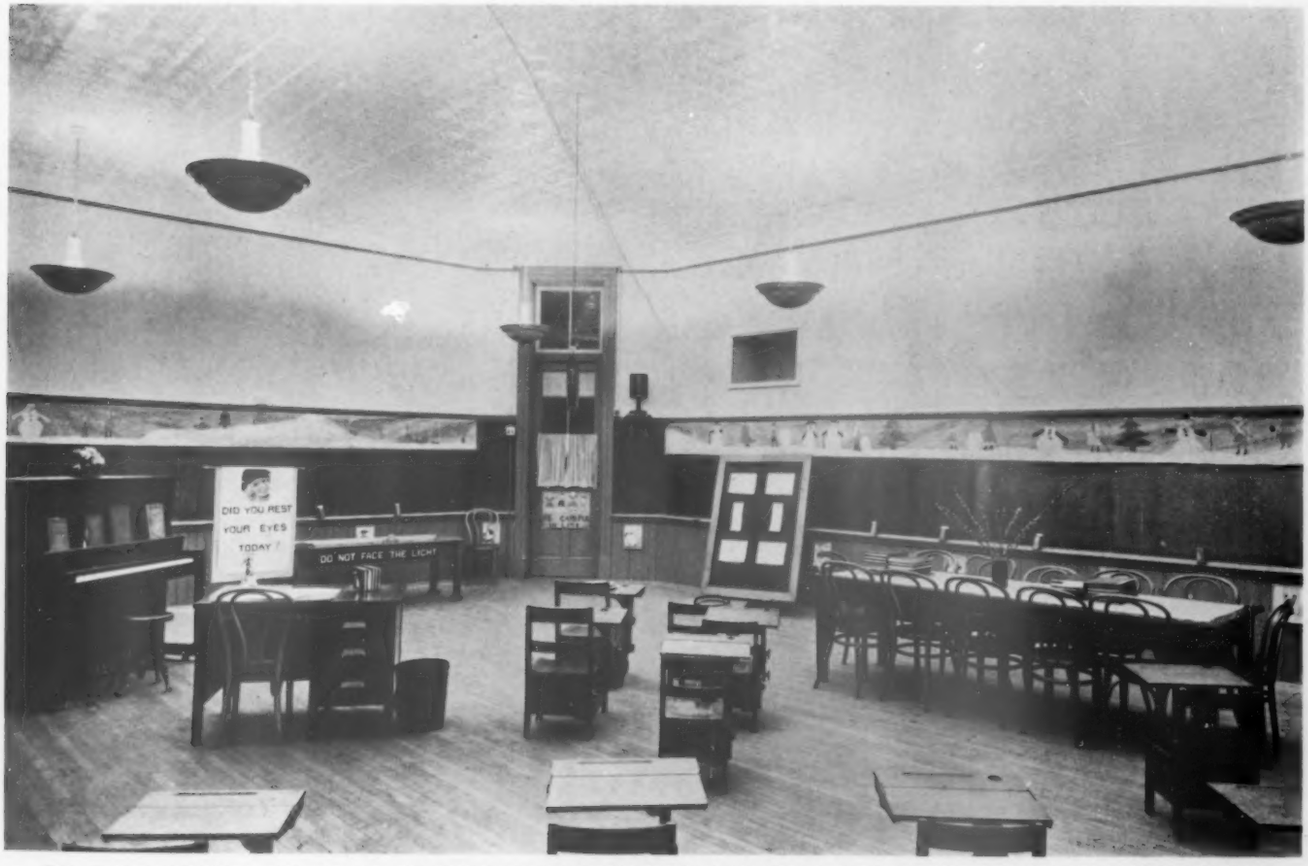


FIG. 4. SIGHT-SAVING CLASSROOMS FOR CHILDREN WITH SUBNORMAL VISION REQUIRE SPECIAL ATTENTION TO THE LIGHTING
This sight-saving room is 27 x 34 feet with a 13½-foot ceiling, and has six 1,000-watt indirect units on 11½- x 14-foot centers, which provide an average in service of 30 footcandles

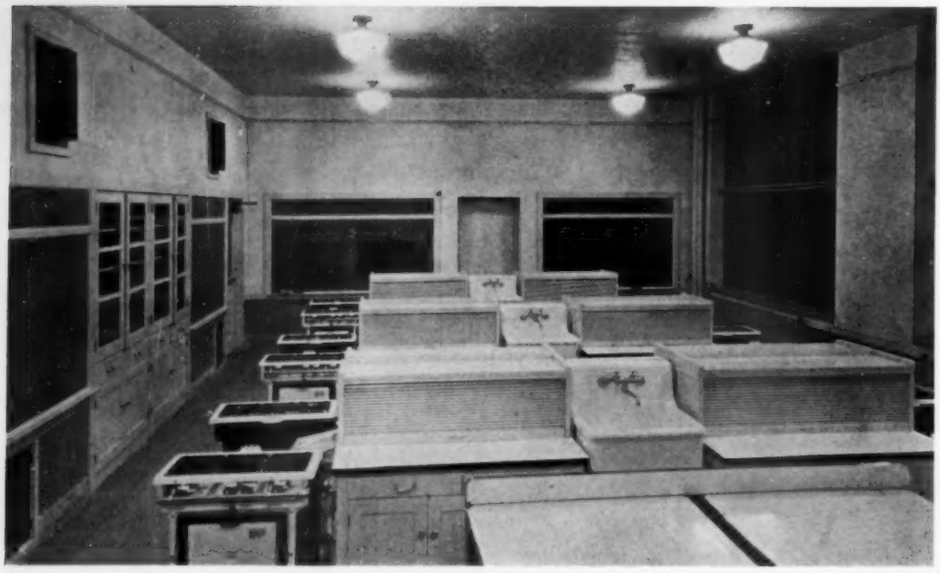


FIG. 5. DOMESTIC SCIENCE AND OTHER LABORATORY ROOMS SHOULD BE WELL LIGHTED TO FACILITATE THE EXPERIMENTAL WORK

This domestic science room, dimensions 18 x 28 feet, has six 300-watt white glass enclosing units on 9- x 10-foot centers. The average illumination in service is 16 footcandles

FIG. 6. IN THIS ART ROOM, THE 500-WATT SEMI-INDIRECT LIGHTING UNITS ARE PLACED ON 8- X 8-FOOT CENTERS AND PROVIDE AN AVERAGE ILLUMINATION IN SERVICE OF 30 FOOTCANDLES

Similar illumination is required for drawing rooms

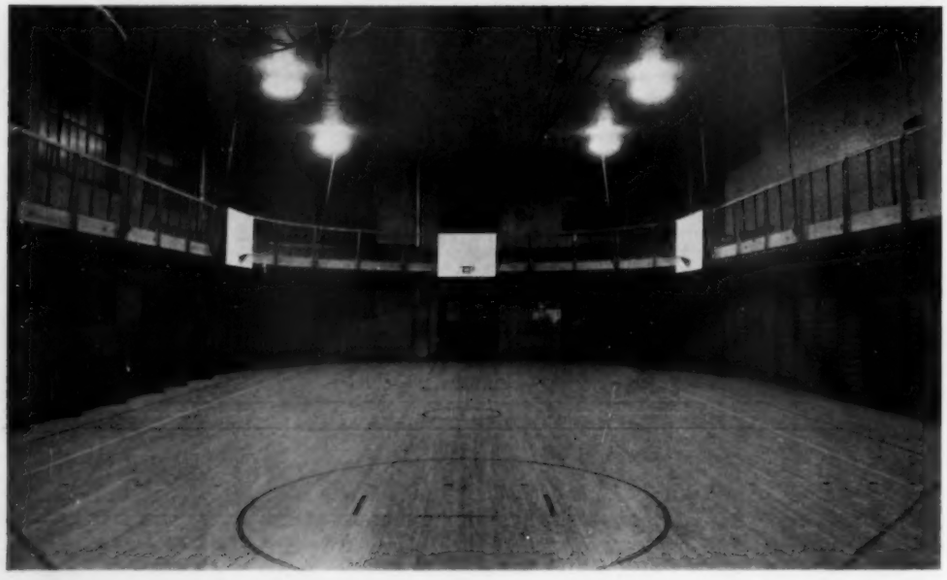


FIG. 7. GYMNASIUM CLASSES ARE IMPORTANT IN THE WORK OF SCHOOLS, AND THE VARIOUS ACTIVITIES REQUIRE A SYSTEM OF LIGHTING WHICH CAN ACCOMMODATE MANY DEMANDS

This gymnasium is well lighted from eight 1,000-watt Glassteel diffusers on 17- x 24-foot centers. The playing area of the floor is 40 x 70 feet, with a 20-foot ceiling. The illumination averages 18 footcandles

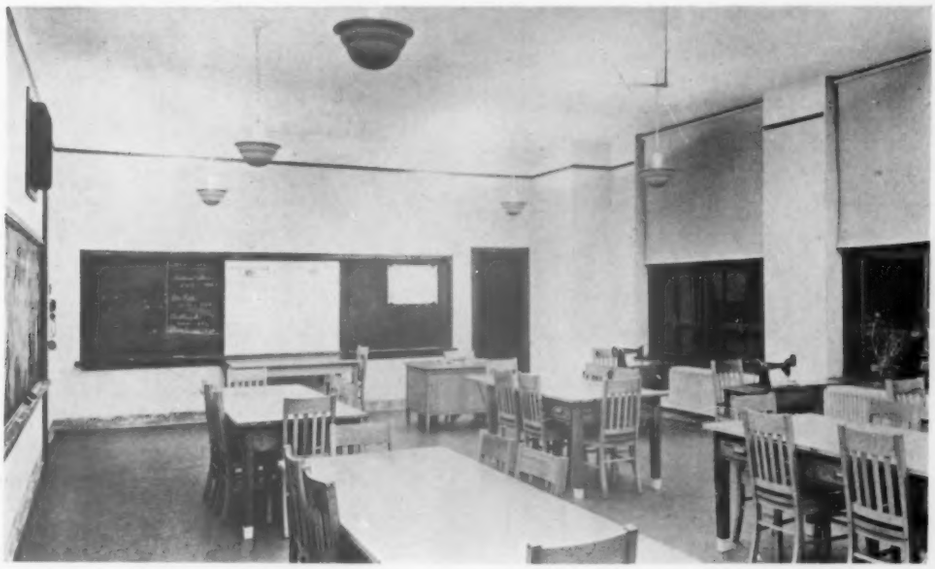


FIG. 8. SIX 500-WATT MIRRORED-GLASS INDIRECT LIGHTING UNITS PROVIDE 18 FOOTCANDLES IN SERVICE FOR THIS SEWING ROOM

The room is 22 x 30 feet, with units on 10- x 11-foot centers. Satisfactory lighting for sewing dark material is best obtained from a small supplementary unit on each machine

FIG. 9. ALL CORRIDORS AND STAIRWAYS THROUGHOUT A SCHOOL BUILDING SHOULD BE WELL LIGHTED FOR PASSAGE WITH MAXIMUM SAFETY

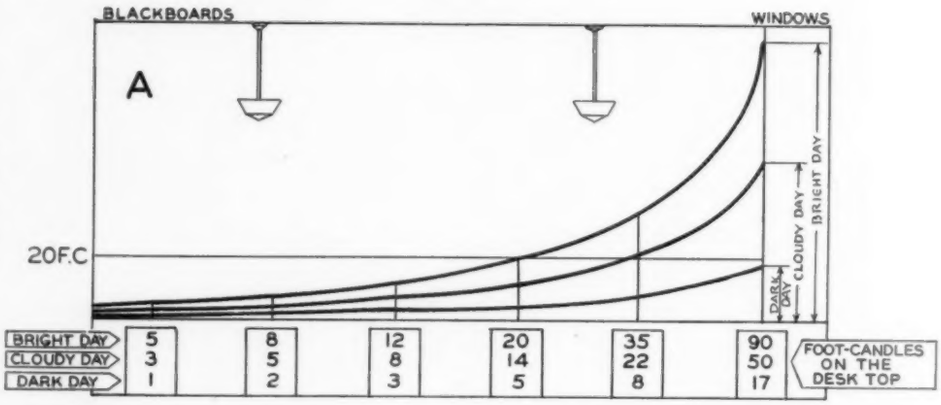
This corridor is 8 feet wide with a 12-foot ceiling, and has 150-watt lamps in white glass enclosing globes on 16-foot centers. The average illumination in service at the floor is 5 footcandles

FIG. 10. GOOD WORKMANSHIP AND SAFETY IN MANUAL TRAINING ROOMS DEPEND IN A LARGE MEASURE ON THE QUANTITY AND QUALITY OF LIGHTING ON THE WORK

This woodworking shop has 300-watt Glassteel diffusers located on 10-foot centers; 18 footcandles are obtained in service

Control Wiring for Outlets

Since practically all class and study rooms have windows to admit daylight, some thought should be given to the design of the artificial lighting so that it will supplement daylight to the best advantage. The curves in Fig. 11 A show the rapid falling-off in footcandles of daylight in a room 21 feet wide as the distance from the window is increased. The three curves represent the illumination levels on bright, cloudy, and dark days. Under the best of conditions the desks near the blackboard side of the room never get more than about 5 footcandles, while the desks near the windows may have as much as 100 footcandles. It is logical, therefore, to plan artificial lighting to compensate for the deficiency in daylight and at the same time not be wasteful in burning lamps over areas where plenty of daylight is obtained. This can be accomplished by wiring the outlets so that those near the blackboard side of the room are on a different control circuit from those near the windows. The row of units near the windows will seldom be required except on dark days and at night; while the inner row will be required most of the time.



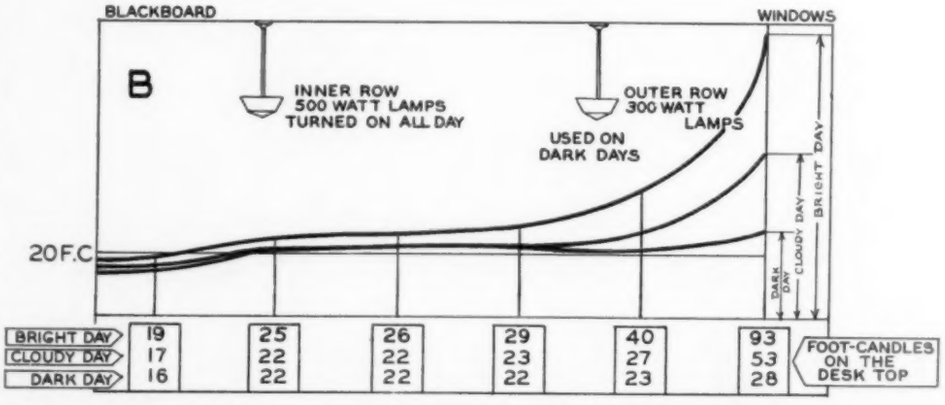

BLACKBOARD
WINDOWS
B
INNER ROW 500 WATT LAMPS TURNED ON ALL DAY
OUTER ROW 300 WATT LAMPS USED ON DARK DAYS
20F.C
DARK DAY
CLOUDY DAY
BRIGHT DAY
BRIGHT DAY 19 25 26 29 40 93
CLOUDY DAY 17 22 22 22 27 53
DARK DAY 16 22 22 22 23 28
FOOT-CANDLES ON THE DESK TOP

FIG. 11 A. CURVES SHOWING DISTRIBUTION OF DAYLIGHT IN A TYPICAL CLASSROOM ON BRIGHT, CLOUDY AND DARK DAYS

FIG. 11 B. DAYLIGHT ILLUMINATION SUPPLEMENTED WITH ARTIFICIAL LIGHTING

On both bright and cloudy days the inner row of 500-watt units are necessary to raise the general level to approximately 20 or more footcandles, and on dark days all lighting units are necessary, the outer row employing lamps of the 300-watt size

FIG. 12. THE BLACKBOARD CONTINUES TO BE THE STANDARD MEDIUM OF EXPRESSION FOR MOST CLASSROOM EXPLANATIONS

When the class is large and the teacher's demonstration requires sharp concentration, a system of special blackboard lighting makes a vast improvement in the visual problem involved. Each of these units, delivering light through prismatic glass plates, employs two 150-watt mazda lamps. The units are mounted on 5-foot centers and provide 25 footcandles of illumination

By comparing the curves in Fig. 11 B with those in Fig. 11 A, it is observed how the artificial lighting system can be used during the daytime to level off the illumination around 20 footcandles for at least two-thirds of the room. It should be noted from Fig. 11 B that the inner row of 500-watt units is required every day, while the outer row of 300-watt units is needed only on dark days. The use of lower wattage lamps is suggested for the outer row of outlets in recognition of the fact that a great majority of the class and study rooms are practically never used at night. In this case, it is fair to assume that during school hours there will always be at least a low level of daylight on the window side of the room. On the other hand, in those rooms which may be used at

night-time, it is most satisfactory to equip all outlets with the same size lamps in order to provide an even distribution of illumination. For a typical classroom, 500-watt units would then be recommended for both the inner and the outer row of outlets.

Quality of Lighting—Type of Luminaire

The proper amount of light is not all that must be provided; of equal importance is the proper quality of lighting. In other words, the lighting of schoolrooms must be free from direct glare and glaring reflections so that there will be no extreme brightness contrasts in the line of vision. Furthermore, harsh shadows should be softened. Exposed lamp filaments are bright and glaring and produce harsh shadows, whereas light from a diffusing glass luminaire of large area provides a low brightness source, and because of its large area tends to shine around an object and consequently to soften the shadows. White glass enclosing globes have been used for many years in classrooms with a fair degree of satisfaction, but the majority of them are too small for the size of lamp required, in which case they are uncomfortably bright. Where such globes are used in the schoolroom, it is recommended that the following sizes of glassware be employed:

Recommended Minimum Diameters of Enclosing Globes for Classrooms

150-watt lamp	14-inch globe
200-watt lamp	16-inch globe
300-watt lamp	18-inch globe

A still better quality of lighting can be obtained with totally-indirect or semi-indirect lighting fixtures. All or most of the light is reflected from the ceiling, which becomes an extensive light source of relatively low brightness. Since some of the light is absorbed by the ceiling, roughly 30 per cent more wattage must be supplied than is necessary with the enclosing globe system for the same illumination. However, the lighting is more comfortable, both direct and reflected glare are minimized, and sharp shadows are eliminated.

Illumination Levels

During the past few years there has been developed a new Science of Seeing which has established a fundamental basis for prescribing the amount of light necessary to carry on all the various classes of work and study such as those found in school buildings. The researches in seeing which Dr. M. Luckiesh* and Frank Moss* have conducted have established beyond reasonable doubt that human beings see most quickly and easily and with a minimum of wasted energy when their work is illuminated to levels of the order of those commonly found out-of-doors. Because of economic and engineering considerations, however, footcandle recommendations have always been a compromise between ideal and inadequate levels, and in practice have been much nearer the inadequate than the ideal. There has in the past been no rational method which the illuminating engineer might employ to enable him to prescribe lighting levels for various visual tasks. Except where specific tasks have been evaluated in the laboratory, it has been well-nigh impossible to determine with any fair degree of accuracy the relative severity of seeing tasks. How much harder is the seeing task in one case than in another? In the past the answer has been based on guesswork and so, perforce, has been the lighting recommendation.

For this reason the recent development of a technique and an instrument which make it possible to prescribe footcandles on a rational basis is considered a definite and important forward step in the progress of the lighting art. The Visibility Meter, an instrument developed by Luckiesh and Moss, bids fair to revolutionize the present practice of lighting specification. As shown in Fig. 1, the instrument resembles in a general way a large pair of goggles, except that the apertures through which the observer looks are relatively small. The Visibility Meter consists essentially of two colorless filters with precise gradients of transmission-factor which may be rotated simultaneously before the eyes while looking at an object or while performing a visual task. The observer holds the instrument in approximately the same position in which eyeglasses are worn, and with a finger of the right hand slowly turns a disk which rotates the gradients until the visual threshold or the borderline of performance of the visual task is reached. These measurements of visibility may be made in a few seconds even by an untrained observer.

The visibility of objects or visual tasks varies enormously, and obviously is the fundamental factor in seeing. Upon visibility the efficiency and welfare of human beings largely depends. In seeing, the human seeing-machine is interested in (1) the visual task, (2) the visual sense, and (3) light and lighting. Visibility involves these three realms and also certain *human* factors which can be taken care of by factors of safety determined by measurements of threshold visibility. Obviously, little is known about anything until proper measurements are made. The Visibility Meter is a portable device developed to fill such a need in seeing.

The instrument has two *rational* scales which are based upon many years of research. These are:

Relative visibility—scale range, 1 to 20.
Footcandles recommended—scale range, 1 to 1000.

* Lighting Research Laboratory, General Electric Co., Nela Park, Cleveland, Ohio.

The visibility scale has an absolute rational basis founded upon the maximum ability of persons with average normal vision to recognize the details of a simple describable object of definite size and contrast. In an absolute sense a setting of unity on the visibility scale represents the limit of average normal vision under favorable conditions for seeing. The scale value "2" indicates that the object or task is twice as visible as the smallest object which can be recognized by persons with average normal vision. It is the scale of relative visibility that is used to determine the relative difficulty of two or more visual tasks.

The scale values of recommended footcandles have no obvious relation to the scale values of relative visibility. They represent an arbitrary compromise between the footcandles necessary for barely seeing and the enormously higher footcandle-levels for easiest seeing. That the scale of recommended footcandles is conservative is attested by the fact that it is based upon the visibility of reading matter printed with 8-point (Bodoni) type and black ink on excellent white paper and illuminated to a level of 10 footcandles. This task corresponds to the scale value "10." A scale value of "20" for another task under the same illumination as the former basic task indicates that it should have 20 footcandles in order to be as visible or as easily performed as the foregoing standard task (8-point Bodoni Book Monotype printed with black ink on white paper and illuminated to 10 footcandles).

Visual tasks in schools are of many different kinds, some of which are simple and easy, while others are complex and difficult. Taking these factors into consideration, the footcandle values listed in Table I are recommended as practical and conservative levels of illumination. Tests and investigations which have been conducted during the past few years by school authorities have definitely indicated that school buildings, and in particular work and study rooms, should have better lighting than found in general use. One such test was discussed by Prof. H. B. Dates in the 1935 edition of the AMERICAN SCHOOL AND UNIVERSITY. Another more recent investigation was reported by Willard Allphin at Buffalo, N. Y., September 2, 1936, before the national convention of the Illuminating Engineering Society. This investigation was made in two classrooms (Nos. 11 and 12) at the Russell School, Cambridge, Mass. The two rooms adjoin each other on the second floor of the building, each having dimensions of 28 feet x 32 feet with 11-foot 10-inch ceiling. The artificial lighting in room 12 was furnished by four enclosing globes with 150-watt lamps which provided 4 to 6 footcandles on the desks. In room 11 six luminous-bowl indirect units were installed, which provided a level of illumination such as recommended in Table I, namely 20 footcandles. In this room the row of units away from the windows was operated continuously during school hours. The row near the windows was operated by a photronic relay set to maintain a minimum level on the desks of 20 footcandles.

The Cambridge School Department gave Miss Gertrude B. Duffy full charge of the test. Miss Duffy, who graduated from Boston University with honors, holds a major certificate, a bachelor's degree and a master's degree, all in psychology. She was assisted by William J. Crissy of Harvard University, who is responsible for most of the statistical treatment.

Eighty-two fifth-grade pupils (41 in each room) were used for the test. They were given a Kuhlmann-Anderson intelligence test, grade V, fourth edition, and a Metropolitan achievement test, grade V, intermediate battery—complete: Form A. The two teachers alternated, each teaching half of the subjects to both classes. They were instructed to operate the lights in room 12 only under such conditions as they had been operated under in previous years.

The teachers were told not to explain the test in any way, and if asked a direct question to merely say that the School Department was trying out some new lights. However, it was very evident that teachers and children enjoyed the lighting in room 11.

The photoelectric relay functioned with no trouble of any kind and resulted in the outside row of lights operating for 17 per cent of the total school hours. In room 12 where the lights were operated manually, they were used 28 per cent of the time. There were 135 actual school days covered by the test.

A summary of the results of the mental tests is as follows:

The gain in educational age of the pupils in room 11 over those in the poorly lighted room 12 was 10 per cent, while the gain in reading age of the pupils in room 11 over those in the poorly lighted room 12 was 28 per cent.

Typical Well-lighted Interiors

The layout of outlets for general lighting in the different rooms throughout a school building should be planned by applying the spacing and mounting-height rules given under the classroom lighting discussion. Moreover, the wiring control for the outlets should be installed to permit the separate use of selected lighting units as desired to supplement daylight. Examples of well-lighted school interiors are shown in Figs. 5 to 10 inclusive. The captions for the illustrations give data on each lighting layout and indicate the average illumination obtained in service.

SETTING UP FACILITIES FOR AN OFFICE PRACTICE COURSE ON A MODEST BUDGET

BY A. C. BEAVER

Washington School for Secretaries,
Washington, D. C., and New York City

THE extensive use of machines and office appliances in conducting the business of America is not a vogue; it is a powerful movement, based on economy and efficiency. There is no reason to think there will be a reduction in the use of machines; on the other hand, there is every reason to expect the movement to expand in extent and intensity. Sound education for business dictates that we recognize the present situation and the future trend, and include in our secondary schools a general elementary office-machine training that will prepare students for the demands they will meet on going into business.

To attend one of the annual business machine shows is to be amazed at the number and variety of machines available for carrying on the nation's business. Yet this bewildering number of machines and appliances can be classified under relatively few basic operations. A clear knowledge of the functions of these machines enables the informed educator to select a comparatively small number of machines which will give a basic knowledge of the functions and operations of all.

For example, a recent textbook on office machines and appliances classifies them under five headings: (1) accounting and record-keeping machines; (2) duplicating machines; (3) name- and data-writing machines; (4) dictating machines; and (5) miscellaneous labor-saving machines.

A course of instruction based on such a classification of office machines does not contemplate the use of all machines available in each division. In each case it is possible to select a few machines and, through their use in the classroom, to give basic training and theory which immediately makes the others understandable and usable with relatively little adaptation. Once the theory and operation of a

A Class in Office Practice—A Comparatively Small Number of Machines Gives Basic Knowledge of the Functions and Operations of All

machine in one of these divisions is understood, the student has laid a usable foundation for all in actual business life.

This selective use of representative machines and appliances has another very practical aspect in that it makes it possible for a school to teach the subject with a minimum investment in equipment. While each year sees new models which carry last-minute improvements, the basic features of these machines change very little, and the basic knowledge and operating skill can be easily acquired in secondary schools.

Administrators and teachers who have a serious interest in teaching the use of office machines (and the substantial amount of office practice which comes from such learning) are invariably gratified to learn that the machine and appliance equipment for teaching the course under the five divisions outlined above can be installed with an expenditure of about $1,000, as follows. A mimeographed list of these appliances and further suggestions will be furnished by the author on request.

Type of Equipment	Approximate School Price
1 adding machine (listing)	$135.00
1 calculating machine (non-listing)	76.50
1 duplicating machine (hectograph)	38.50
1 duplicating machine (stencil)	30.00
1 duplicating machine (stencil)	22.50
1 name- and data-writing machine	93.00
1 name- and data-writing machine	145.00
1 checkwriter, key type	112.75
1 dictating machine (transcribing)	225.00
1 bookkeeping machine	202.50
Total	$1,080.75

A further economy lies in the demonstrated ease with which the course can be merged into a typing, bookkeeping, office practice, or shorthand class, and taught by the apprenticeship method. One student "breaks in" another on the various machines, just as one employee "breaks in" another in a business office. This procedure requires a minimum of supervision by the teacher and results in a highly practical addition to the training of students who are preparing for office work.

COMMERCE AND SECRETARIAL SCIENCE DEPARTMENTS, THE UNIVERSITY OF AKRON

BY W. W. LEIGH

**Professor of Business Administration,
The University of Akron**

THE Commerce Department of The University of Akron, Ohio, has an enrolment of approximately 150 students, and more than double this number of evening students. Heretofore, we have been quartered in the Engineering Building, a two-story, factory-like structure that squatted on the west end of the campus. This building, laid out in the shape of a block U, was originally planned for engineering laboratory purposes, and a classroom building was to have been erected across the two wings so that it would abut upon the street to the south. The classroom building did not materialize; consequently, the wings of the laboratory had to be converted into classrooms. The interior of the building was unfinished, and the makeshift partitions which were erected were unsubstantial, unsightly, and far from noise-proof even against the human voice, much less against the hum of motors, the "put-put" of engines, and the angry growl of testing equipment. Our offices were crowded together on a sort of a mezzanine floor overhanging the main laboratory. Naturally, such limited physical facilities served as a barrier in attracting new students, seriously hampered our work and impaired student morale.

The New Building

In November, 1935, President H. E. Simmons announced that a Federal grant of $163,331 had been allotted for a new building on the campus. Plans were made for a classroom building which would complete the engineering unit projected several years ago. The building was to be a three-story brick structure, 140 feet wide and 60 feet deep, which would stand on the corner of the campus and form a front for the old engineering "Lab." This plan placed a heavy strain upon the architects because the old building was low and severely plain. The ground rose sharply from the street at this point, which enabled the new structure to rise three stories from the sidewalk level and gave

a much more imposing front than could have been obtained otherwise. Although the design is plain and simple, to harmonize with the old section, a very pleasing effect has been obtained by employing a recessed entrance and the decorative use of white sandstone.

Brick and concrete upon a steel frame insures a fire- and noise-proof construction throughout. Furthermore, the materials and workmanship have been of the best quality. In addition, the new building will provide automatic heat control and controlled air circulation by means of a univent system.

The new building will house the Physics Department on the ground floor. The second floor, with the exception of an auditorium with a seating capacity of 324, will be devoted to classrooms for the Engineering College, and the third floor to Commerce and Secretarial Science. In addition, these two departments will occupy the top floor of the two wings of the old building. By this change the floor space definitely allotted to these two departments has been increased from 3,500 square feet to approximately 11,600 square feet, although 500 square feet of this will be given over to offices for members of the Arts faculty of the University.

Layout of the Commerce-Secretarial Floor

The layout of the space allowed to the Commerce and Secretarial Science Departments was largely determined by the architectural limitations and the necessity for joint use of the space. The floor plan is shown in Figure 1. I shall point out in only a brief way how these factors shaped the plan.

Our first requirement was for a large accounting room that would comfortably seat 40 or more students. We do not like such large classes in this subject, but evening session registration occasionally compels us to begin courses with this number. The Secretarial Science Department needed a similar space for typewriting. These two rooms thus became the starting point of the plan.

In the course of our previous planning, however, we felt that our new quarters should provide, if possible,

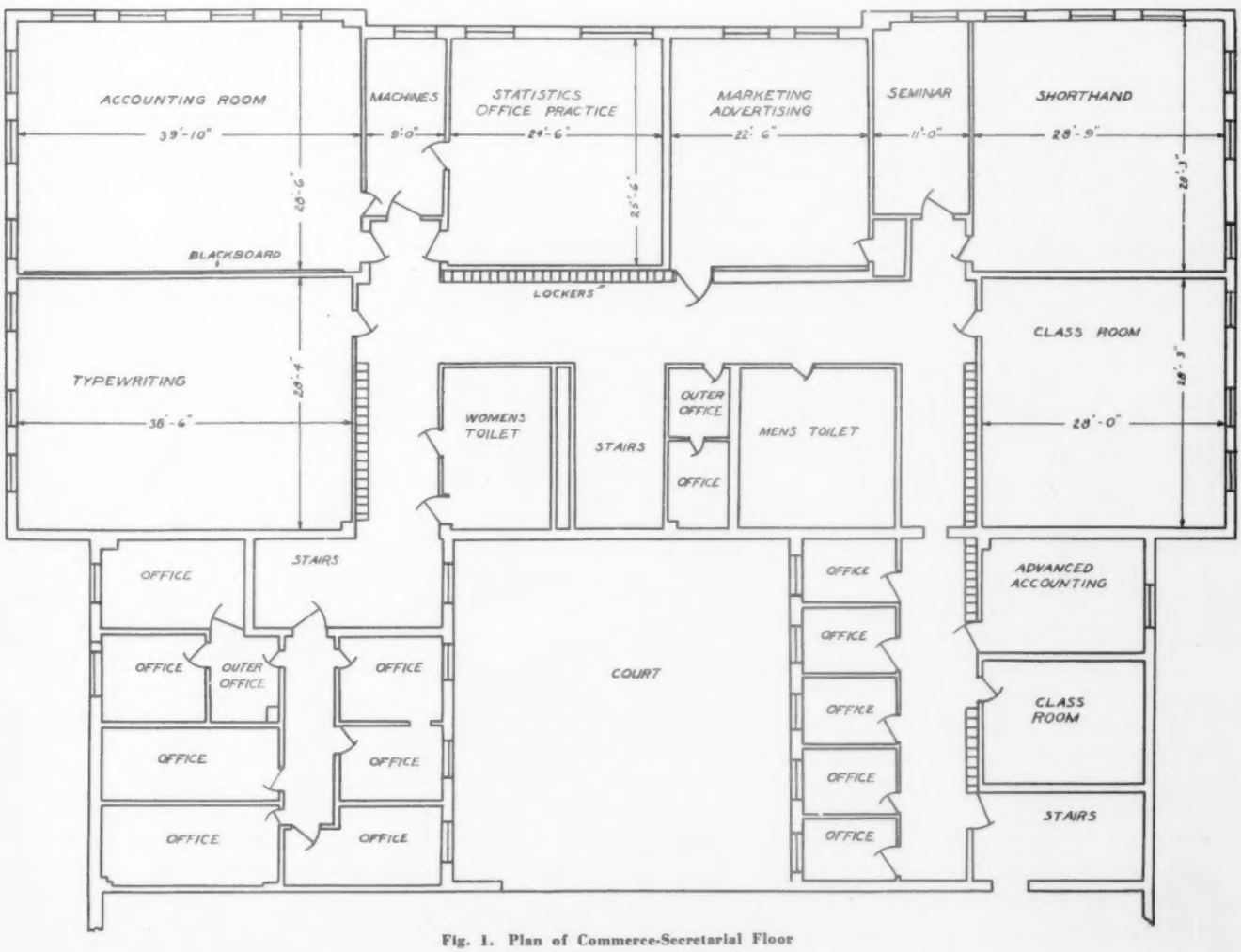


Fig. 1. Plan of Commerce-Secretarial Floor

Fig. 2. Ruled Blackboards in the Accounting Rooms Speed the Instructors' Demonstrations

first, a machine room, second, a seminar room, and third, space for the storage of marketing-maps and charts. A machine room was desired to insure protection and control over the adding and calculating machines, and at the same time to make them generally accessible. This room was placed between the Accounting and the Statistics and Office Practice rooms because these courses constantly require machine equipment either for formal instruction or for service. The doors to the respective classrooms make it possible to restrict the machines to class purposes, and the hallway door permits general use of the equipment at practically all times with a minimum of confusion. By planning the Marketing and Advertising and the seminar rooms together, closet space for marketing-maps and charts could be provided. This arrangement still gave a seminar room that would seat 15 people comfortably around the tables. Such a room was sufficiently large for most advanced groups and for departmental faculty conferences.

In addition, space was needed for a shorthand room, two classrooms, and an advanced accounting room. The shorthand and large classrooms were originally planned as they appear in Figure 1. The other two rooms, however, were to have been much larger, since the stairway that appears in the corner was to have been put in the old building. When this stairway arrangement proved impossible, it was then too late to remove the partition and make the two small rooms into one large one without incurring endless red tape and risking possible delay. As a result, the advanced accounting room will seat only 17 students, but there will be other rooms equipped with tables which will serve for accounting purposes, should the need for greater seating capacity arise.

The office layout is much better than existed formerly, although it is not as we anticipated. Plans were made for individual offices for members of the staff, a large office for the special instructors who teach only in the evening session, a rest room for the girls, and a work room for students. The pressure for office space precluded this "idyllic" arrangement, however. Those of professorial rank will have individual offices, but instructors will have to share offices.

Equipment

While we are not so fortunate as to be able to provide new equipment throughout, considerable new equipment will be installed, for the old is entirely inadequate. The new installation will be primarily tables constructed to our specifications, since we prefer tables for much of our work. The large accounting room will be furnished with five rows of tables 24 inches wide and 30 feet long. For Marketing and Advertising, similar tables, though only 18 inches in width, will be used. Dual-purpose tables have been designed for the Statistics and Office Practice room. These represent an experiment. Facilities had to be provided to accommodate a few advanced typewriting classes, but the demand did not warrant a second specialized room. The problem, therefore, was to provide a general-purpose room and yet one that was adapted to typewriting. This has been accomplished, we believe, by designing tables that will serve both as machine tables and as flat desks. The tables will be approximately 20 feet long and 20 inches wide, and at intervals of every 2¼ feet there will be wells to hold the typewriters. This plan will provide desk space for 30 students and typewriter wells for 24 machines.

The most interesting and novel piece of equipment, perhaps, will be the blackboards in the accounting

rooms. For the former Accounting Laboratory, a columnar board 10 columns wide and 21 lines deep was designed. With this board the instructors could quickly demonstrate any record or work-sheet form and show all entries properly. It was a tremendous success, so similar boards will be installed in the new rooms. The old board will be mounted in the Advanced Accounting room and a new 14-column board will be constructed for the large one. This board will be about 5 feet wide and mounted 3½ feet from the floor, to enable all students in the room to see every section of it. Special lights will be mounted over the boards to eliminate glare.

As we examine the arrangement, it seems to be almost perfection. We have ample space for the present, the rooms are clean, attractive, and quiet, and our offices are cheerful and quite private. The cumulative effect of this improvement upon students and staff alike is going to be most wholesome. Furthermore, at last we have a home of our own—quarters that are allocated to us as a group, that are adapted to our needs and for which we are responsible.

ALTERATIONS TO THE LIBRARY OF THE UNIVERSITY OF THE SOUTH

BY ALFRED MORTON GITHENS

Architect, New York City

A LOFTY hall with tall mullioned windows, wainscoted walls and wooden ceiling, reminiscent of the college libraries of Oxford or Cambridge; crowded to overflowing with books; books lining the walls, bookstacks in the central portion two tiers high, bookstacks wherever they could be put, and volumes piled high on top of them, here and there in the aisles between them, and in the attic over the high wooden ceiling; reading tables at one end of the hall, desk and work space at the other, with ranges of bookstacks in between; a room with a singular personality and old-time flavor, a room one does not forget; this was the University Library at Sewanee, Tenn.

There was no finished basement. The space underneath had been roughly excavated to rock. There was a line of massive round wooden posts down the center supporting a heavy wooden floor-construction. But floor and posts were riddled through and through by termites, and ready to collapse.

The Basement Space the Solution

Thus there was a double problem: an acute need for more space; and the worst case of termite-infestation we had ever seen.

Now, no two building problems are exactly alike, and such a situation may not occur anywhere else; but it might, and perhaps an account of the solution may be helpful to someone—for it seems to have been thoroughly successful and not particularly costly.

The unused basement was the key. No addition was made to the building; there was simply an intensive use of existing space.

The basement was cleared of all wooden construction, waterproofed, and utilized as a stack-room. The main floor, thus relieved of all books but those in frequent demand, greatly increased its seating capacity and gave space for desk, workroom, and an alcove by the western fireplace for lounging and casual reading. The bookcases lining the walls and several projecting double-faced cases were retained; all others were removed and the gallery-tiers were done away with.

A stack-room below the main floor is no longer experimental. It is easily reached by a stair near the desk, down only 7½ feet. The uprights of stack-construction support the floor, which is formed of a continuous reinforced concrete slab 3 inches thick, with no beams or girders. This is the arrangement in several of the larger libraries and it is quite practicable in operation. Somerville and Springfield in Massachusetts, Wilmington in Delaware, the Enoch Pratt in Baltimore—all these are of this sub-stack type.

Drainage

A dry basement was essential. The rock was roughly leveled off; tile drain-pipe was laid in a slight depression close along the inside face of the walls and wherever there were any other depressions in the rock

that might collect rainwater through natural seepage; the lines of tile were connected and carried through the wall and away from the building to a lower place in the grounds. Then the floor was finished in concrete and waterproofing, leaving a narrow open space next the wall, so that any rainwater seeping through the old masonry would flow down the inside face and find its way to the drain-tile. An inner wall of 3-inch terra-cotta partition-tile was built several inches clear of the wall. Then all was ready for the stack construction and the new floor.

The Process of Construction

The Library had to function continuously through the entire alteration, so the work from this point was done in two sections: the eastern half of the building was cleared of books and tables and fenced off temporarily, while the western half was in full use. The old wooden basement posts had been removed and the floor temporarily shored up in place; now the old floor was carefully leveled, since it was to be used as centering for the new reinforced concrete floor. This was quite a saving; for the "centering," the temporary layer of boards or what one might call the "mold," is one of the expensive items of concrete construction.

Then the new steel uprights of the basement stack construction were located, holes were cut in the old wooden floor exactly over each, the steel uprights carefully placed in position, floor reinforcement laid, and the 3-inch concrete slab was poured.

After a week or more, the old wooden floor and beams were removed piecemeal, some of the shelving was installed in the new stack, and the desk, the tables, the current books, and all active paraphernalia were moved into the new section.

The process was repeated for the second half. Eventually the library took possession of the entire floor. No interruption of service occurred, though dust could not be avoided and it was all sadly inconvenient at times. Wall bookcases had to be adjusted, the wainscoting patched, the rubber-tile flooring laid, and certain windows enlarged.

Heating and Ventilation

Meanwhile the heating was completely changed. Steam was still drawn from the University power plant; but, instead of direct radiators, five unit ventilators were installed. This apparatus combines an electric fan and a brass fin-radiator enclosed in an enameled steel cabinet. These are spaced along the walls in line with the bookshelves, and so arranged that the air passing through them can be drawn either from the great room itself or from the basement stackroom next the floor, or part from one and part from the other as desired.

The colder it is, the faster the fans are run; so more air passes through the radiators and consequently more heat is given off. In mild weather the fans are run only early in the morning; during the rest of the day the air passes through the radiators of itself. Thus in either case there is a constant circulation of air up from the stackroom at the walls and down into it by the open stairway (a convection current, as it is technically called), so there is no stale, dead air left in the stack. In summer, when there is no steam in the fin-radiators, the fans can be turned on and a thorough circulation of air assured.

Perfectly dry air in a basement if stagnant and chilled by contact with cold walls or floor is generally mistaken for damp air. The basement is condemned as damp; whereas it is only cold, with still, cold air. If the upper part of the room is warm, the sensitiveness to cold at the floor is exaggerated. Thus the need for a slow but constant movement of air throughout, up, across and down, in a convection current.

This current should be inside the room. If in order to obtain the current only air from outdoors is brought in, the apparent dampness may become real dampness under certain weather conditions.

The warmer air is, the more water it holds in suspension, the more water it insists on having. When our house-radiators are turned on in the winter, the air in the house, being warmed, demands more water and steals it from any available source, from the woodwork until it is parched and shrinks, and cracks appear here and there; from dried glue in the furniture until joints open; from our own bodies, until we become nervous and headachey and restless, unless we are inured to it by long experience.

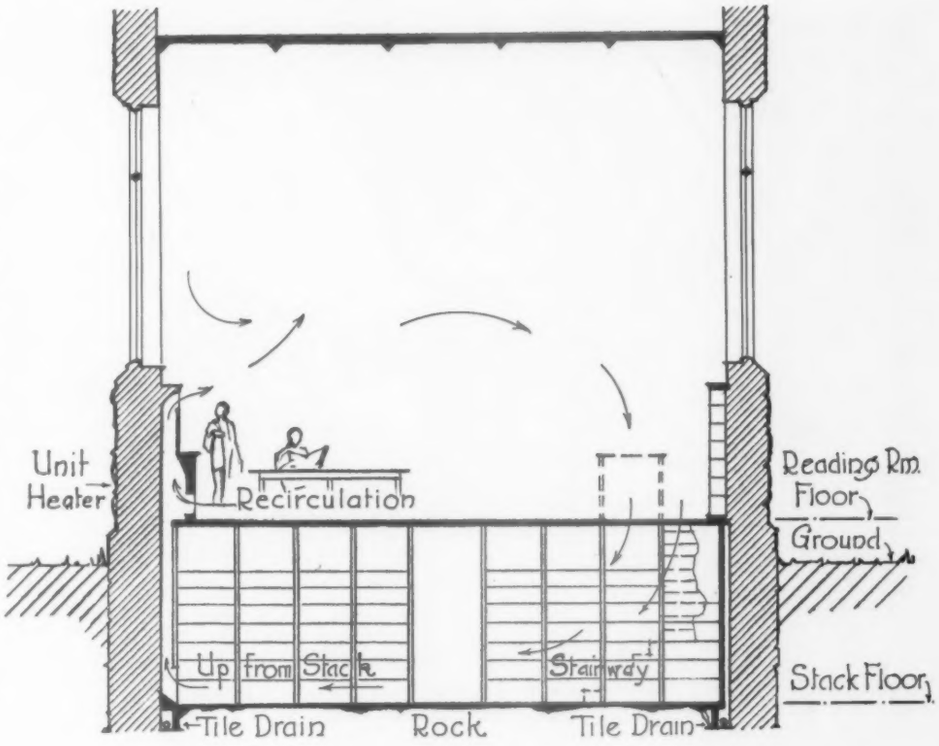
Conversely, when normal air is chilled, it throws out the water it has held in suspension. August evenings chill the air, so the water it contains is deposited. We call it dew.

Open the basement windows on a sudden hot spring day. The chances are that walls and floor will become wet. The wet is not a leakage of water from the earth outside, but a condensation from the warm air introduced from outdoors and chilled by walls and floor. I have seen parts of the first story of the Metropolitan Museum in New York so wet under these conditions that it was difficult to walk on the marble floors without sliding, and visible moisture covered the walls.

This is one of the reasons why at Sewanee we preferred a wholly interior convection current to one fed from the outside air. If it were practical to have out-

Ventilation by Convection

side air as a third source of supply to the unit ventilators (the first two sources being the air from reading room and from basement stack respectively) it might have been useful at certain times; but a third source controlled by by-passes seemed too complicated to manage and continually adjust. It seemed wiser to use the windows for an outside air source. Much air would always leak in through windows and doors, and a large supply of outdoor air is less important than a proper movement of indoor air.



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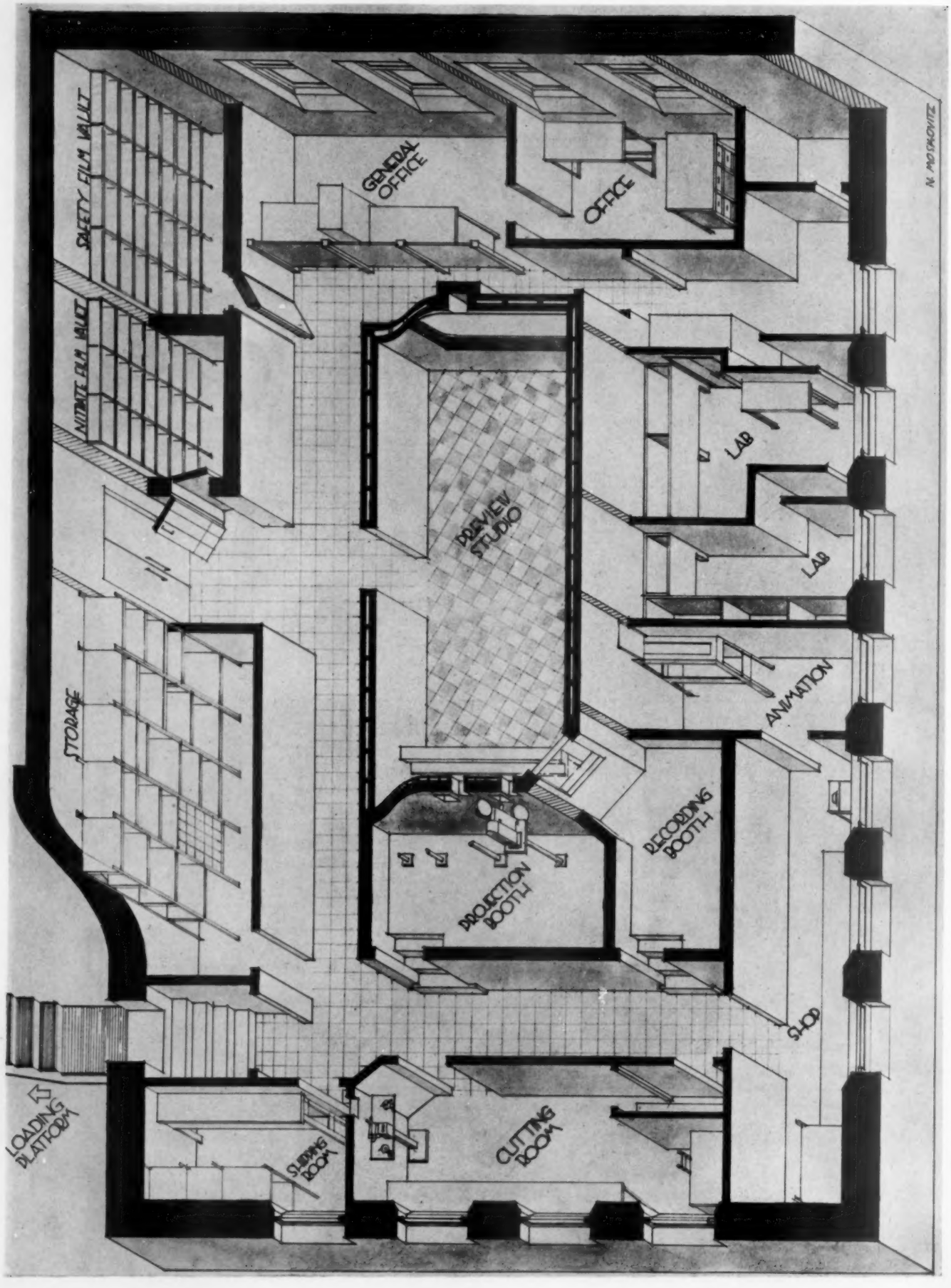

SAFETY FILM VAULT
NITRATE FILM VAULT
GENERAL OFFICE
OFFICE
LAB
LAB
PREVIEW STUDIO
ANIMATION
STORAGE
RECORDING BOOTH
PROJECTION BOOTH
SHOP
LOADING PLATFORM
SPLICING ROOM
CUTTING ROOM

A VISUAL EDUCATION SERVICE AT THE COLLEGE LEVEL

BY ROBERT A. KISSACK, JR.

Director of Visual Education,
University of Minnesota

WHEN, in 1932, the General College was inaugurated at the University of Minnesota, visual aids (slides, motion pictures, and other types of illustrative material) were considered necessary and efficient tools, often helpful and frequently indispensable to the teacher. To this end, therefore, a visual education program was set up, designed for and correlated with the various courses of instruction in the General College. A start was made to collect and classify the sources of all such available visual aids; a minimum of suitable projection equipment was acquired; and with a staff of three (one in charge and two part-time Electrical Engineering students as assistants) a program of servicing General College classes with illustrative materials desired by instructors was experimentally launched.

The use of this new and specialized service was found of such real value in General College teaching that during the first year operations of the service rapidly increased and expanded, as indicated by a total of 293 showings of motion pictures, slides, etc. Yet not quite all these 293 bookings were for the General College alone; the service was used by other colleges and departments; the idea was beginning to spread.

Since then, this service has so increased throughout the University that the bookings during the year 1935-36 totaled 1,653, the staff numbered 28 (6 on full time, 22 on student part-time), and the work expanded to include: the centralization of authority of all University-owned visual aids equipment and materials; the responsibility for the care and maintenance of all projection equipment; the storage and handling of University-owned film; the maintenance and operation of all public address systems; the providing not only of projection but also recording services and production of motion pictures; the operation of a weekly Newsreel Theatre; the conducting of an Appreciation of Motion Pictures course and a Photography course (both for the General College); and also a course in Visual Aids in Teaching for the College of Education.

Naturally, the small quarters originally provided on the top floor of Wesbrook Hall soon proved inadequate; so in the summer of 1935 a large basement room in the same building was set aside, remodeled, and subdivided to provide adequate and efficient facilities, as illustrated on page 290.

The extension of the scope of Visual Education Service Enterprise activities set up to centralize, maintain, and operate all University-owned visual aids material and projection equipment has been naturally linked with that of public address systems. Thus, the amplifying units of portable sound projectors have been frequently used as temporary public address systems to solve special problems of acoustics in certain classrooms. Similarly, the amplification system of the sound projectors in Northrop Auditorium has been in operation at convocations and nearly all large University gatherings and functions in that hall. The Visual Education Service has also supervised the installation of other permanent public address outfits, and is now authorized to maintain and operate all such equipment on the campus. More convenient cooperation is thus also provided in connection with certain broadcasts from the University radio station WLB.

The production of educational films—a complicated and time-consuming business in itself, but a basic necessity for any important and vital visual education program—has steadily been continued and improved throughout the year. The production schedule has thus far included a variety of films (some in 35 mm, some 16, some silent, some sound, some track, some disc) for such divergent University needs as: a film for Psychology classes treating of feeblemindedness; a film for the University at large to show the service of the University to students and to the state; a series of sound films for the Speech Clinic to assist students in overcoming speech defects; a film on the activities of the Nursery School; a film on tuberculosis (which has been widely distributed and exhibited both in this country and abroad); a series of films on nursing procedures employed for the past three years by the School of Nursing in its teaching and training; a film for the Department of Women's Athletics on "Styles and Qualities of the Dance" and on women's sports; a film for the Zoology Department to illustrate varieties of marine animals; a film record of certain important neurological cases at the University Hospital; and a film for the Board of Health and the Hydraulics Division on "The Contamination of Drinking Water by Back Siphonage."

The above outline merely indicates the scope and progress of visual education at the University of Minnesota during the four years of its existence. The annotated illustrations in the following pages may supplement and help visualize a few details of the physical set-up.

Office

The centralization headquarters of the Visual Education Service at the University of Minnesota is in the basement of Wesbrook Hall, conveniently located in the center of the extensive main campus. Here is filed all the available information concerning visual aids materials and equipment that might be helpful to Faculty members in all departments of the University. From here are directed the activities of centralization, distribution, production, and projection. Often as many as 22 classroom showings of motion pictures, slides, etc., per day—sometimes 5 or 6 of them simultaneously—are handled by the projection crew. Merely to arrange the many details of this complicated daily all-University booking schedule requires the constant attention of a full-time assistant. The service operates on a cost plus business basis, designed to become within a few years completely self-supporting.

Entrance Hall

On the walls of the entrance hall are displayed photographs made by the University's photographic laboratory, situated at the University Farm, four miles distant from the main campus. For eight years, under the direction of the official University photographer, this laboratory, fully equipped for every type of photographic service from photo-microscopic equipment, studio and field work, to news service, has been supplying University needs. An indication of the scope of this work is the approximate output estimate of the handling of 7,000 negatives, 20,000 prints, and 2,000 lantern slides per year. New main campus quarters established in the visual education offices (see plan, page 290) including dark-rooms for negative, printing, and developing, and a variety of equipment for copying, enlarging, and slide making, makes it now possible to offer for the General College a practical laboratory course for amateurs.

Film Vault

Two film vaults are provided for the storage of all University-owned motion picture film, one for safety film (capacity 2,500 reels of 16-mm, 400-foot length) and one for nitrate or flam film (capacity 750 reels of 35-mm 1,000-foot length). The position of these vaults (see plan, page 290) was predetermined by the existence of a large brick chimney that could be converted into a proper ventilator flue leading from the flam film vault up through the roof of the building. They are of fireproof construction, as required by fire regulations; and, by means of a special insulating job and cooling system, both humidity and temperature can be maintained at optimum conditions for film preservation. Other types of visual aids, slides, still pictures, etc., are kept by individual departments unless centralized storage is desired.

Storeroom

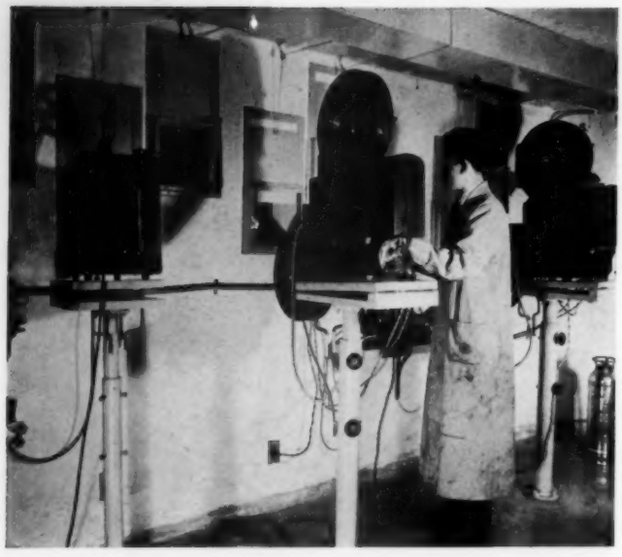
Storage space is provided for numerous types of portable projection equipment (lantern slide, opaque, combination, overhead, film strip, 35-mm silent and sound, 16-mm silent and sound); screens and accessories; lights, cameras, and other production equipment; microphones, amplifiers, and other public address equipment; a complete standardized stock of projection bulbs; and a host of indispensable odds and ends. Such portable projectors are scheduled for classroom use throughout the University to supply the needs of rooms where infrequent use does not justify permanent installation. They are kept in as constant use as possible; maintenance and long-term amortization is provided by rental and service charges; and thus misuse, disuse, and duplication of equipment are avoided. Present University equipment, both portable and permanent, totals some 137 slide or opaque projectors, and 43 motion picture projectors of various types.

Preview Studio

Nearly every day in this screening room are held previews of educational films for University faculty members. This 15 x 30-foot room is carefully sound-insulated, and is in fact a room within a room, inner walls being quite separate from outer ones. Cork floor, acoustically treated walls and ceiling, insure excellent acoustics. A properly velvet-masked 5 x 7-foot sound screen is mounted at the front of the room over a built-in high-fidelity speaker. Three exhaust outlets in the ceiling effect ventilation at the rate of 624 cubic feet per minute, inlets consisting of a series of sound-absorbing baffles within the wall itself. Collapsible chairs seating an audience of 24 persons can easily be removed, and because of the excellent sound-insulation treatment of the room, it can thus be used for sound recording. An outlet box supplies current for lighting the necessarily small but adequate area for either silent or sound camera work. The room is therefore termed a "preview studio," and because of this double duty is in almost continuous use.

Preview Bench

At the rear of the preview studio is constructed a raised platform accommodating four chairs and a long, narrow table or preview bench, the inclined surface of which is evenly illuminated by a series of shielded tubular lights giving adequate illumination to read or write but not enough to detract from the illumination of the projection screen. During film previews, notes are taken on specially prepared forms where space is provided for details, not only such as number of reels, sources and producers, rental and purchase price, but also print condition, negative, sound, and photographic qualities, educational level, direction, educational use, teacher's comment, and an analysis of the content of the film. All this information is later transferred to special library cards arranged in a master file sysem with a system of cross indices.



Projection Booth

The projection booth adjoining the preview studio is of fireproof construction, ventilated, and provided with four projection ports and four observation ports of double glass. This insures complete silence in the preview studio while projecting—a necessity during dubbing or post-synching work. It also provides space for stands supporting four projectors, a convenience and time-saver during the screening of a variety of types of educational films. Uninterrupted projection of a program composed of 35-mm silent, 35-mm sound, 16-mm silent, and 16-mm sound, track or disc, is thus possible. A special impedance matching transformer properly matches any type of amplifying unit to the permanently installed loudspeaker in the preview room. Rewind and tool bench, film cabinet, monitor horn, telephone and special indicator board, keeping booth in close connection with preview room, further aid efficient operation.

Cutting Room

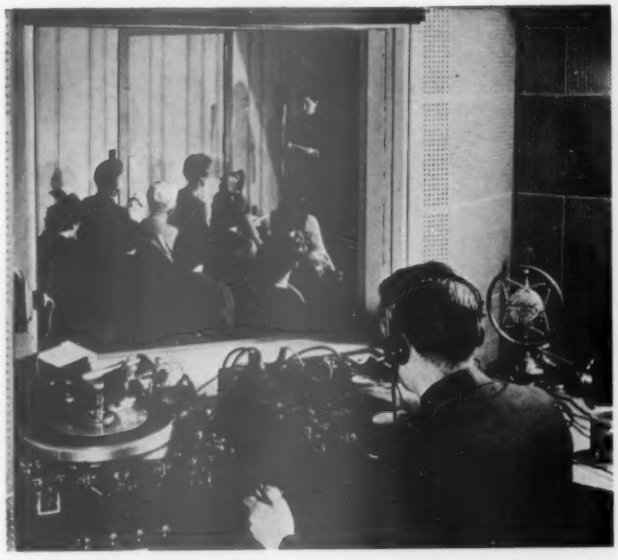
Every attempt is made to keep the cutting room free from dust and dirt. Walls are painted glossy white and windows sealed. A separate blower supplies clean air through two air filters. A careful daily cleaning schedule in addition to these precautions thus permits the handling, cutting, and matching of negative as well as positive film. Accurate records are kept of all production details, and production assistants have developed many short-cuts and standard procedures that help assure maximum quality at minimum cost. Shooting off the cuff is frowned upon; as much preparation as possible before shooting has proved necessary even in the most simple and pedestrian of sequences. Detailed scenarios, camera and lighting charts, shooting scripts, and a shooting record containing, in one chart, negative scene list, exposure and camera entries, and first cutting notes, help save production time and money.

Splicer

The filtered air supply in the cutting room creates a positive pressure tending to expel dust from entering the door. As additional precaution when handling negative, all cutters wear clean gloves and lab coats. An editing bench equipped with rewinds, viewing box, reel poles, film bins, and for both 16- and 35-mm, extends the length of the room. A small dark-room at one end makes camera loading and unloading convenient. With the professional model footpower combination splicer illustrated here, a large volume of either 16-mm or 35-mm, sound or silent, positive or negative splicing can be neatly and quickly handled. Thus, it is used frequently not only for production work but also for the inspection routine of all University-owned film, particularly the film-library of the General Extension Division, rented and booked through Extension but stored and serviced by the Visual Education Service.

Recording

The ceiling and walls of the recording booth are lined with material to insure good monitoring acoustics. The large, double glass monitor window set at an angle allows wide vision into the preview studio. Sound is monitored through a high-fidelity speaker, and a separate talk-back amplifier and microphone can be cut in at will to the preview-studio horn permanently installed behind the projection screen, thus furnishing two-way communication. A switch for the pilot light inside the studio and the warning light outside the studio door (controlled also from the studio) prevents interruption during recording. Professional 35-mm sound-on-film equipment for which the booth was designed has not yet been installed, the present recording equipment consisting of an instantaneous sound-on-disc recorder cutting its own groove in either aluminum or acetate records and at either 78 or 33 1/3 rpm.



Dubbing

Aluminum disc recordings are made for the Department of Speech, which sends over classes of students on a regular schedule. Thus each student has his voice recorded at the beginning and again at the end of the quarter on a 6-inch aluminum disc given to him at very nominal cost for subsequent classroom and individual study. During the first winter and spring quarters that Visual Education took over this service, 2,534 individual recordings were accomplished. The quality of aluminum recordings is naturally far from perfect, though of adequate accuracy for voice study where relatively few playbacks are required and cost must be kept down. For superior quality, acetate records, slightly softened before the groove is cut, have given excellent results. Experimentation on a small scale has been continuously carried on with mixing and with dubbing from film to disc, disc to film, and even from disc to disc for duplication of records.

Sound Movies

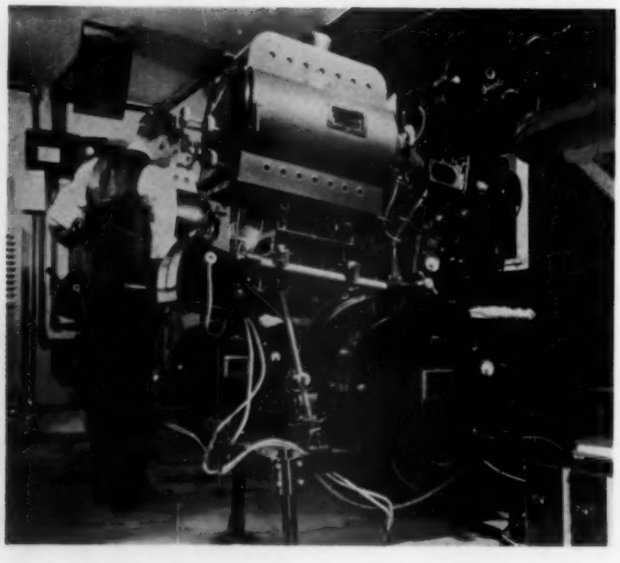
Experiments with the production of sound movies have proved quite successful. A 16-mm silent camera with 200-foot magazine is motor-driven at the single frame crankshaft and at sound speed by a flexible coupling mechanically interlocked with a turntable running at 33 1/3 rpm. Thus, with camera set up in the recording booth, shooting through monitor window into the studio, perfectly synchronized sound on acetate disc movies can be turned out at exceptionally small cost. This service has proved especially valuable to the Speech Clinic, where students suffering from speech defects or impediments can be recorded in sound movie close-ups, and thus later see, hear, and analyze their difficulties to an extent that greatly facilitates cure. Experimentation with various film stocks, non-glare blue filtered lights, and acetate discs has assured consistently good results in picture and sound quality.

Shop

A small shop provides for the endless succession of maintenance, repair, construction, and rush jobs connected with the servicing of so many varied types of projection, production, and amplification equipment. The official University maintenance shops, and the scientific repair shop handle all usual types of construction, but for special jobs and particularly for experimental work, this Visual Education shop space has proved invaluable. A lighting and power distributing unit and switchboard handling 300 amperes, and with 20 stage plug outlets, has been constructed for extreme compactness and portability for location shooting. A sampling of other jobs includes: design and construction of eight exponential type loudspeakers; spot and floodlight housings, collapsible stands, cable reels, bulb box, light vanes, diffusers, and reflectors; blimp, sunshades, triangles, follow focus, titleboard, pneumatic-tired camera truck, collapsible 10-foot camera tower; and many props, flats and sets.

Transportation

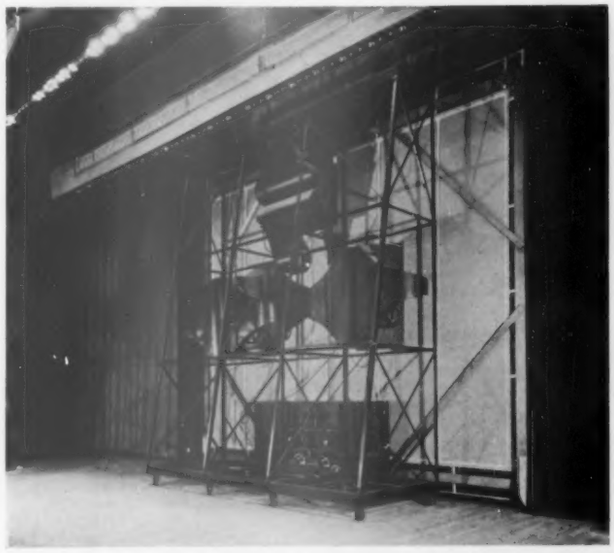
The large daily number of classroom showings and the frequent use of centralized portable equipment throughout the campus require a special transportation service. The regular University truck route delivery not being feasible for short notice set-ups, a transportation assistant and the use of his car are employed to move projectors and accessories, to help the projectionist in setting up and taking down, to make film pick-ups or deliveries. All centralized equipment is checked before it leaves the central office, for condition, and for lens, bulb, extensions, reels, accessories and extras; every film used by or sent out through the office is inspected before it is projected; every classroom set-up is investigated or is checked in the files of room-survey sheets made up from previous experience. For only by thus checking and rechecking all possible variables can a satisfactory projection service be guaranteed.



Projection Booth—Music Auditorium

Large classrooms or auditoriums in most University buildings contain fireproof projection booths. A few of these are equipped with 35-mm silent projectors; in others, centralized portable projectors are employed when needed; and there are three permanent installations of sound projectors—in the Farm Administration Auditorium Powers machines with Electraphone sound, in the Music Auditorium (pictured here) Simplexes with Western Electric sound, and in Northrop Auditorium Super Simplexes with Western Electric Wide-Range. In the Music Auditorium (capacity 600 persons), the Visual Education Service presents its Foreign Language Film Series and the General College "Film and Theatre" course, planned to enable students to see good films not locally available, to establish possible criteria of good and bad in films, to indicate the difference between the separate arts of stage and screen, and to explain by profuse illustration film history, social influence, industry, and production methods.

Horn Tower—Northrop Auditorium



Behind the 20 x 30-foot sound screen in Northrop Auditorium the Wide-Range speaker system requires a movable horn tower of massive proportions. In this theatre, seating 5,000 persons, film projection reaches a consistently high professional standard. Here for four years has been operated the General College Newsreel Theatre, designed not for entertainment but as an educational project integrated with University courses of instruction. Five 50-minute programs of current news and selected short subjects are presented one day each week during class hours throughout the entire school year. Regular contracts with Fox, MGM, Paramount, RKO, Universal, March of Time, assure wide news coverage. The cooperation of the local distributors has been excellent. An individual admission or laboratory fee of only 5 cents, and a large student and faculty attendance, defray all running expenses. Last year the total attendance was estimated at 62,000.

Camera Crane

During the shooting of the Nursing Procedures film it was necessary to obtain a travel shot near to and over a series of hospital ward beds. Only some sort of camera crane could do the trick; so—a crane was built. Though little more than a glorified seesaw, it served its purpose well and is typical of a host of other home-made gadgets constructed at small cost to secure higher than amateur production results. This attempt towards professionalism, however, is only a desirable methods criterion; before film production for any department is undertaken, the basic questions must be answered: Is the subject capable of visual presentation? If so, would stills or slides serve just as well? If not, should this inherently film material be silent or sound? Only after these questions are satisfactorily answered, and then each scene described, planned, and scheduled, are the cameras allowed to roll; only thus can adequate results be expected on the restricted shoestrings of educational film budgets.

Visual Instruction Laboratory

During the first session of the 1936 Summer School a new course in Visual Aids in Teaching was given by the Visual Education Service for the College of Education. It was designed as a practical demonstration laboratory, stressing the practical rudiments of visual aids equipment and materials, use, operation, and availability, subordinating to outside reading such topics as historical background, verbalism, and teaching theory, and taught by a practical visual instruction method profusely and concretely illustrating every point of discussion. Cooperation of all important manufacturers of visual aid equipment and materials in the country in placing generous exhibits of their wares during the five-weeks course, guaranteed real success (loan display value over $7,350). The 67 students enrolled, representing a cross-section of teachers from subnormal schools to superintendents of school systems, were thus assured instruction and laboratory practice in splicing, and in slide, opaque, film-strip, 16-mm silent and sound projection.

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Photographing the Eyes At Work

Teachers have for years been faced with the problem of separating pupils who are poor readers from those capable of carrying the necessary reading load. Because of this lack of positive classification, many children have been thought dull when the whole trouble lay in their inability to read correctly.

The Ophthalm-O-Graph provides positive information concerning reading habits. It is a portable eye movement camera which furnishes the teacher with actual photographs (graph) of the student's eyes—taken while they are at work. From these the reading ability of the student can be quickly determined.

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The Ophthalm-O-Graph can be operated by anyone after brief instructions. Using 35 mm. movie films, it is extremely economical, the cost of each test being only a few cents.

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Efficient reading, photographic records show, is rhythmic reading (left to right) with the fewest number of fixations and regressions per printed line.

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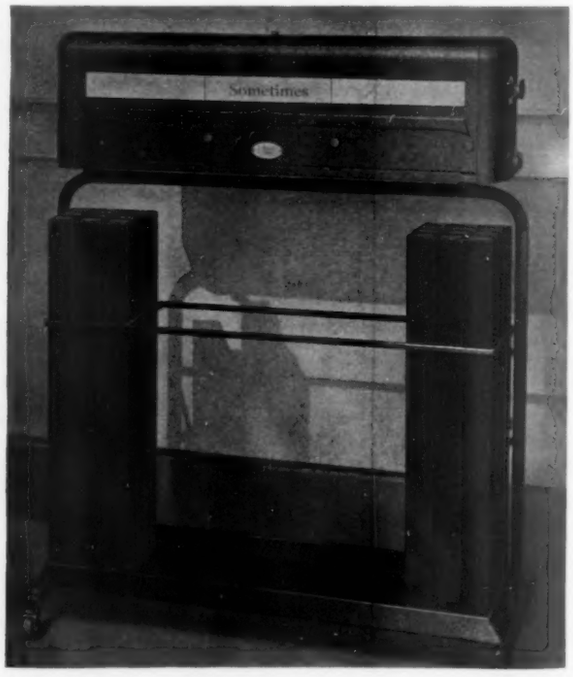

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The Metron-O-Scope Requires Only the Insertion of a Reading Roll, a Flick of a Switch, and It is Ready for Use.

Leading Educators Use Controlled Reading

The Ophthalm-O-Graph and Metron-O-Scope are being used successfully in leading schools and Universities throughout the country. Eminent authorities on prevention and correction of reading difficulties agree that these new instruments are the greatest single innovation in the teaching of reading that has been made.

The American Optical Company will be glad to furnish you on request with complete information on "Controlled" Reading, together with the names of schools or universities, using the Ophthalm-O-Graph and Metron-O-Scope in your vicinity.

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SUPER SIMPLEX PROJECTORS, SIMPLEX ACME SOUND PROJECTORS, SIMPLEX SEMI-PROFESSIONAL AND SIMPLEX PORTABLE SOUND PROJECTORS

Standard professional 35 MM motion picture equipment for Theatres, Auditoriums, Schools, Colleges, Churches, Hospitals, Private and Public Institutions, etc.

We realize that the purchase of motion picture equipment requires long and serious consideration and advertisements, correspondence or even catalogs are ordinarily inadequate. In many instances decisions cannot be quickly made and it is, therefore, highly desirable to have information personally supplied by representatives of the National Theatre Supply Company, Distributors of Simplex Projectors, with Branches throughout the United States. We are also represented in foreign countries and would like you to write to us for the names and addresses of any of our distributors.

Our wide experience enables us to understand the needs of schools, colleges, churches, hospitals, private and public institutions, etc., and where there is no technical advisor to guide in the selection of equipment the complete line of 35 MM Simplex Projectors places us in a position to impartially advise regarding the kind of equipment best suited to meet the specific requirements of any proposed installation. Projection Room Plans and information regarding installation of motion picture equipment will be supplied to architects and others upon request.

The information which follows is no more than a detailed report which will indicate that we are in a position to serve your needs and we think that in the Educational or Non-theatrical field such information is desirable. In the theatrical field with over 90% of the theatres in this country equipped with our products we are so well known this is not generally necessary.

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For a quarter of a century, a period which covers almost the entire commercial history of the motion picture industry, the products of this company have held an unquestioned, outstanding leadership wherever motion pictures are shown and enjoyed. In New York, Chicago, Los Angeles, London, Paris—the great cities of the world—Simplex Projectors are installed in the largest and finest motion picture houses, and are extensively used in South America, Asia, Australia, Africa, as well as throughout North America and Europe. Over twelve hundred theatres in England, Ireland and Scotland alone are equipped with our products. These facts we believe definitely substantiate our claim "Simplex—The International Projector." Simplex Projectors are used in thousands of rural communities throughout the United States and Canada as well as in the larger cities where superior projection is necessary and dependability is essential. The universal appeal of motion pictures has been made possible and practical for over twenty-five years very largely through the engineers and mechanical staff of this company. Governments, the Army and Navy, great commercial organizations, universities, churches, and other institutions have used Simplex Projectors exclusively for many years. More recently the finest Trans-Atlantic and Pacific Liners have installed Simplex Projectors for the entertainment of their passengers.

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Simplex PROJECTORS

30 YEARS MANUFACTURING EXPERIENCE

Men, Methods and Materials

Many of the men in our plant have been with us from fifteen to thirty years, and have had extensive experience in the design and construction of motion picture projectors. This is of utmost importance as motion picture projectors must be designed and built with a thorough understanding of the practical difficulties of the motion picture field as well as the technical problems.

Scientific Accuracy

Although Simplex Projectors are made with scientific accuracy and projection involves a knowledge of mechanics, electricity and optics, utmost thought has been given to the importance of having our machine simple and dependable. Very satisfactory results can be obtained even by those who have not the skill and knowledge required in order to secure the quality of screen presentation demanded in large motion picture theatres. In the hands of a projectionist with the necessary technical knowledge, Simplex Projectors will meet all reasonable requirements under any conditions. We definitely claim that no other organization is so completely equipped for the manufacture, testing and checking of sound and visual motion picture apparatus.

Simplex parts are made from carefully selected raw material, and this also involves an intimate knowledge of the highly specialized requirements of this field. Every part used in the manufacture of Simplex Projectors is made in our own plant, and whenever required in order to secure greater ease of operation and longer wear all parts are specially hardened and ground. Satisfactory screen results can be secured only through such constant care in the manufacture of Simplex parts. Due to the tremendous enlargement of the picture from the film to the screen, unsteadiness becomes noticeable and objectionable, thus greatly reducing the entertainment value of the picture. Unsteadiness in some instances may be due to errors in photography, but frequently is the result of projectors which are poorly designed and constructed or in a defective condition. Failure to use properly made parts is a harmful practice.

Basic Mechanical Excellence

In addition to basic mechanical excellence, Simplex Projectors have many exclusive patented features which secure ease and safety in operation, and reduce maintenance cost. Supplementing the many other desirable features of Simplex Projectors is our wide sales and service organization throughout the United States and in many parts of the world. Our representatives are also able to help theatre owners and others using Simplex Projectors by solving their technical problems and by prompt, adequate service in supplying parts for emergencies. Service to be satisfactory involves willingness to help as well as adequate facilities and we assure users of Simplex Products that either direct or through our representatives we are glad at all times to be of assistance whenever it is in our power to do so. A cordial invitation is extended to visit our offices and inspect our factory. Packing, shipping and servicing of Simplex Projectors also involve many problems and here again our great experience and vast resources enable us to maintain our outstanding international leadership in this field.

INTERNATIONAL PROJECTOR CORPORATION

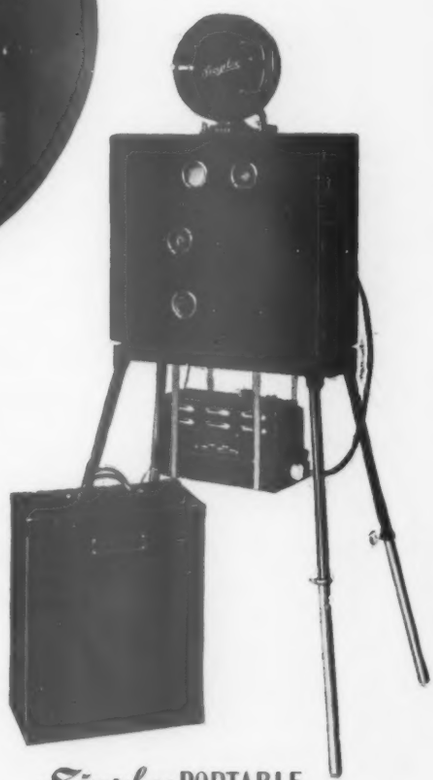
88-96 GOLD STREET • NEW YORK, N.Y., U.S.A.

Simplex Semi-PROFESSIONAL
SOUND PROJECTOR
INCANDESCENT LAMP

Simplex-Acme
SOUND PROJECTOR
LOW INTENSITY ARC

Equipped with
Simplex-Acme
SOUND PROJECTORS

Simplex-Acme
SOUND PROJECTOR
INCANDESCENT LAMP



Simplex PORTABLE
SOUND PROJECTOR

Simplex Semi PROFESSIONAL SOUND PROJECTORS

Simplex Semi-PROFESSIONAL
SOUND PROJECTOR
ARC LAMP

Simplex PROJECTORS AND Simplex PRODUCTS

Sold in the United States by NATIONAL THEATRE SUPPLY COMPANY and distributors throughout the world. Catalogues and other information sent upon request.

INTERNATIONAL PROJECTOR CORPORATION

88-96 GOLD ST. NEW YORK, N.Y.

BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester, N. Y.

New York Chicago Boston Los Angeles San Francisco
London, England Frankfurt A/M, Germany

BDT BALOPTICON—For Slides Only

This extremely popular model is inexpensive, sturdy in construction, compact, easily portable and highly efficient. Its optical system is of exceptionally high quality and (depending on the lamp and lens used) can be used at distances from 4 to 80 feet from the screen. Image sizes range up to as large as 10 feet on the longer side. Maximum illumination. Extremely simple to operate. Still film, micro-projector and overhead projector attachments are available. The sturdy, tilting base is adjustable in two meridians and permits leveling the Balopticon even when placed on an uneven surface. This mounting allows for changing the projection angle for screen at various heights.

Model B is the same instrument as the BDT but without the tilting base. It is recommended for use where a permament installation is being made, although it is readily portable.

ERM BALOPTICON —For Opaque Objects

Model ERM Balopticon is used to project opaque objects only. For that reason, economy is one of the major advantages of this projector. Photographs, pages or pictures from books, charts, drawings, actual objects such as botanical specimens are all excellent materials for this projector. Projects a 6″ square area of object but pages, charts, etc., up to 14″ can be accommodated. Specially designed parabolic reflector produces an unusually bright shadow-free image from a 500 watt lamp. Excels any projector with similar light source offered today.

Model LRM is arranged to project both opaque objects and lantern slides. This instrument allows you material available for both types of projection.

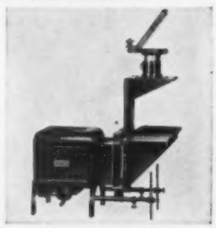
SEND FOR CATALOGS

Catalog E-11, "Balopticons and Accessories," completely describes our line of Balopticons, many of which were omitted here due to lack of space. Micro-Projectors for school and college use are the subjects for Catalog E-20. For information on Bausch & Lomb Microscopes and Spectrographs see page 471 of this book.

KOSB BALOPTICON —For Translucent Screen Projection

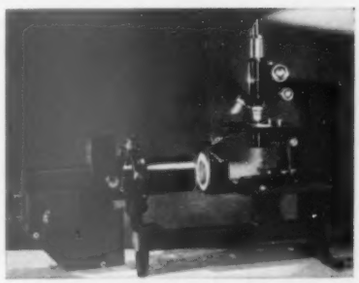
This projector is placed behind a translucent screen and the image is seen on the other side. It is especially designed for class room work for the teacher faces the class, standing by the screen and lecturing on the subject matter illustrated. So simple to operate that the teacher does not require an assistant. So powerful is the illumination that room can be left light enough for note taking. Projects opaque material up to 6″ x 6″ or a 6″ square section of a larger object. Projects standard size lantern slides. Strip film attachment available. Blower keeps interior of projector cool at all times. Easily portable.

OVERHEAD PROJECTOR ATTACHMENT —(For Use with Models B and BDT and KOSB)



This ingenious accessory permits the teacher to operate his own Balopticon and face his class. The image is thrown on a screen back of and over the head of the teacher. Teacher can point to objects on slide with pencil—image of pointer appears on the screen. A most efficient teaching aid and a great time-saver.

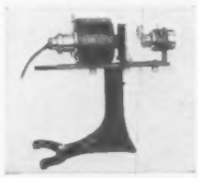
MODEL B MICRO-PROJECTOR



Now Bausch & Lomb offers a new Micro-Projector at a new low price. Any standard compound microscope can be used.

Simply place the microscope on the stage of the projector in an upright position, apply the prism reflector cap to the microscope and focus the illuminator. Complete directions accompany each projector.

Investigate this new instrument before completing your plans for science laboratory development.



TRIPLE-PURPOSE MICRO-PROJECTOR

Especially designed and priced for high schools, this extremely efficient unit serves three definite purposes—(1) projection of permanently mounted specimens on a screen from 4 to 15 feet away. (2) making drawings of microscopic fields. (3) projection of living specimens in liquids. Exceptionally sturdy in construction. Has both coarse and fine focusing adjustment. A two-power projection lens is included.

BALOPTICON TABLE

The B & L Balopticon Table provides a means of placing a Balopticon where it can be used to best advantage. It is portable (rollers on two front legs), and has a shelf underneath for slide boxes.

ERPI PICTURE CONSULTANTS

INCORPORATED

250 W. 57th Street, New York, N .Y.

OVERCOMING LIMITATIONS TO LEARNING WITH EDUCATIONAL SOUND FILMS

Erpi educational films overcome the limitations to learning by bringing reality into the classroom in a wide range of grades and subjects. Teachers equipped with these sound films can at any time bring the secrets and wonders of the universe to their pupils.

With the aid of this marvelous medium of communication the world and its neighbors can become the laboratory of the classroom. Devices which permit unique presentations of ideas, objects and places are: slow motion photography, time lapse observation (action covering days, weeks or months), telescopic photography, microphotography, animated diagrams, reproduction of relevant sounds.

However, the purpose of the sound film is not merely to portray the unusual or to reveal the mysteries of the laboratory, but to give a vivid, stimulating presentation of an important topic. The versatility of this modern educational tool brings to student groups the personality and ideas of outstanding leaders, difficult experiments, illustrations from life situations.

HOW ERPI EDUCATIONAL FILMS ARE PRODUCED

Erpi's educational sound films are the result of seven years' research and planning. Outstanding educational authorities and leaders in production techniques have cooperated.

In producing these classroom films research specialists examine hundreds of courses of study to insure that each picture topic will be integrated with existing school curriculums. Other research men select and prepare materials for inclusion in units of instruction. Outstanding subject matter specialists are consulted as to the authenticity and desirability of the material selected. Concrete examples of this collaboration is the series of science films produced in cooperation with the University of Chicago.

From this wealth of material those elements which can best be presented by the sound film are drawn together. This forms the sound film continuity. The interplay of minds continues on through the time the final manuscript is checked against a rigid array of sound film standards.

Printed supplementary manuals are prepared to increase the usefulness of each film. These manuals which are comprehensive outlines for the topic of which the picture is a part are helpful to the student, the teacher and the adult discussion group. For example, the manual accompanying the film "The Frog," includes suggestions for using the film, a comprehensive teaching plan, an interesting story of the life cycle of the frog and other amphibians, a variety of projects, a list of books for teacher and students and a complete description of the film.

HOW ERPI EDUCATIONAL FILMS ARE USED IN SCHOOLS

Tests conducted in hundreds of schoolrooms by leading educators conclusively prove a marked increase in learning by students who have used Erpi educational sound films.

The audio-visual education program should be built around films that are owned within the school system so that they may be readily used in each class as often as they are needed. Carefully selected Erpi sound films can be used from the elementary school through high-school and college. Often the same film can be used in several courses and at several grade levels. Before starting a sound film unit of instruction the teacher should become thoroughly familiar with the film and with the supplementary manual.

It is well to relate the new film material with subjects previously studied. After each showing it is advisable to hold a discussion emphasizing the important elements of the screen presentation. The teacher's film manuals suggest many activities that may be pursued as well as bibliographies suitable for the students.

The value of the sound film is not exhausted with the first showing. Repeated showings, each with a special purpose adapted to the progress of the students, are decidedly helpful. A second showing after the students have developed a greater background will suggest new problems for investigation. Shown a third time the film crystallizes the various concepts and ideas that the students have established in their study.

Erpi's research staff will analyze your curriculum without cost to determine which films will be best for your purpose and, if desired, will assist in organizing your audio-visual instruction program.

ERPI EDUCATIONAL SOUND FILMS

FOR SALE ONLY

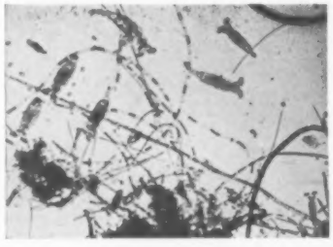
BIOLOGICAL SCIENCE

Plant Life

Plant Growth
Roots of Plants
Flowers at Work
Seed Dispersal
Fungus Plants
The Dodder
Plant Traps
Leaves

Animal Life

Animals of the Zoo
How Nature Protects Animals
Beach and Sea Animals
Tiny Water Animals
The Frog
Spiders
Aphids
Moths
Beetles
Butterflies
Pond Insects
The House-Fly



HUMAN BIOLOGY

(Produced in cooperation with the University of Chicago)

Mechanisms of Breathing
The Heart and Circulation of the Blood
Body Defenses Against Disease
The Nervous System

PHYSICAL SCIENCE

(Produced in cooperation with the University of Chicago)

Oxidation and Reduction
Molecular Theory of Matter
Energy and Its Transformations
Sound Waves and Their Sources
Fundamentals of Acoustics
The Work of Rivers
The Work of the Atmosphere
Exploring the Universe
Geological Work of Ice
The Earth in Motion
Electrodynamics
Electrochemistry
Electrons
Mountain Building
Volcanoes in Action
The Solar Family
Ground Water
Electrostatics
The Moon

NATURAL SCIENCE

(Harvard University Series)

The Earth's Rocky Crust
The Wearing Away of the Land
The Work of Running Water
Animal Life
Reactions in Plants and Animals

SOCIAL SCIENCE

The Development of Transportation

VOCATIONAL GUIDANCE

The Builders
Choosing Your Vocation

MUSIC

The String Choir
The Woodwind Choir
The Brass Choir
The Percussion Group

FOR RENTAL OR SALE

TEACHER TRAINING

Teaching with Sound Films
Dynamic Learning
Individual Differences in Arithmetic
Guidance in Public Schools
The Primary Teacher at Work

CHILD PSYCHOLOGY

The Study of Infant Behavior
The Growth of Infant Behavior: Early Stages
The Growth of Infant Behavior: Later Stages
Learning and Growth
Early Social Behavior
Stages of Child Growth
Posture and Locomotion
From Creeping to Walking
A Baby's Day at Twelve Weeks
A Thirty-six Weeks Behavior Day
A Behavior Day at Forty-eight Weeks
Behavior Patterns at One Year
A Few Tests of Child Intelligence

6 REEL FEATURE—"LIFE BEGINS"

(Produced by the Yale Clinic of Child Development in collaboration with Erpi Picture Consultants, Inc.)

Erpi Picture Consultants
INCORPORATED

250 West 57th Street
New York, N. Y.

THE AMPRO CORPORATION

2839-51 North Western Avenue
Chicago, Ill.

The AMPROSOUND PROJECTORS

SPECIALISTS IN VISUAL EDUCATION EQUIPMENT

AMPRO has made the 16 mm talking motion picture as practical as the silent film for school use. The Amprosound reproduces the sound film with smooth, clear, natural tone, equal to that of a professional theatrical performance; and has been specially designed so that anyone can easily operate with no more skill than is needed for the operation of an ordinary radio. Threading is simplified by the use of guides, so that film finds its proper position almost automatically. The Amprosound is distinctively different in design and principle, with many remarkable features not to be had in any other equipment. You will be astonished at the quality of 16 mm sound-on-film projection which you may now secure on Ampro equipment at low cost.

AMPROSOUND JUNIOR MODEL

The Junior Model is equipped with a 500-watt lamp, 2″ F 1.85 super projection lens and a 10″ speaker. Complete in two cases, total weight 53 pounds, all standard accessories included, $375.00.

AMPROSOUND SENIOR MODEL

For larger audiences up to 1000 the Senior Model with its 750-watt illumination, more efficient lenses and 12″ auditorium speaker is recommended. Complete in two cases, total weight 57 pounds, all standard accessories included, $415.00.

CONVERTIBLE MODELS

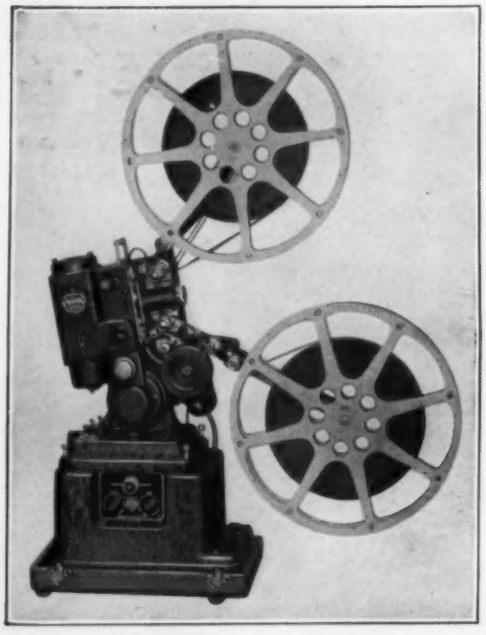
Models MC and NC have been designed to fill the needs of those who might be interested in projecting 16 mm sound pictures at some later date but need only 16 mm silent film now. To preserve their investment in projection equipment, these models are priced to compete with the best silent equipment available; at the same time, provision has been made so that they are readily convertible into the Amprosound projector. Instead of buying an entirely new machine later and losing the investment on the silent projector, you simply add the additional parts required for sound. Then the converted instrument is identical with the Amprosound unit, and contains all the parts necessary for high quality sound film reproduction.

CONVERTIBLE MODEL MC PROJECTOR

Model MC consists of the Model J standard Ampro, 500-watt projector with automatic pilot light, special sound motor, triple claw for running either silent or sound films and all needed parts for quick conversion to sound. In De Luxe carrying case with all standard accessories, $165.00.

CONVERTIBLE MODEL NC PROJECTOR

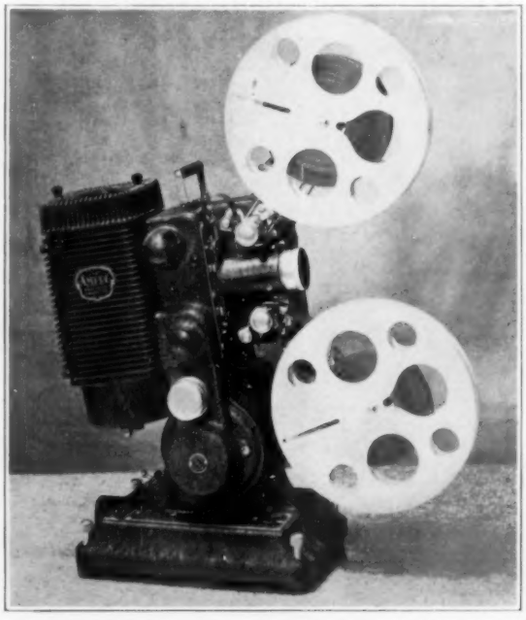
Model NC consists of the Model KD 750-watt projector with automatic pilot light, special sound motor, triple claw and all necessary parts for quick conversion to complete sound unit. In De Luxe case and all standard accessories, $185.00.



Ampro Equipment Meets with Instant Approval Wherever It Is Installed. Every Day It Becomes More Valuable and Useful to Principals, Teachers and Students Throughout the Nation

Licensed Under Western Electric Patents Approved by The National Underwriters Laboratory

Address Educational Department for specifications circular



BELL & HOWELL COMPANY

1850 Larchmont Ave., Chicago, Ill.

New York Hollywood London

Manufacturers of

Educational, Professional, and Personal Motion Picture Equipment

FILMO AND FILMOSOUND PROJECTORS

Every school asks two things of its projection equipment: that it give theater-quality performances without eyestrain—and that costs of operation be low.

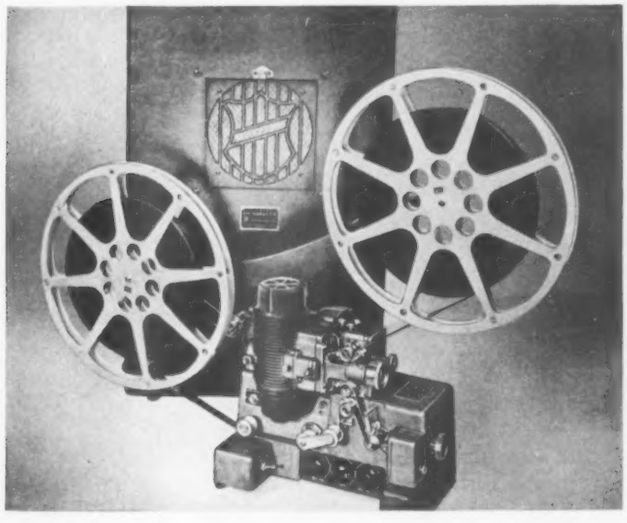
The cost factor in projection equipment is not alone the initial cost of the projector. It includes upkeep, repairs, depreciation, and the expense occasioned by film wear. In Bell & Howell Filmo and Filmosound Projectors, superb mechanical construction includes such exclusive features as floating film protection, metered lubrication, a perfected optical system in permanent alignment, accurate voltage regulation that lengthens lamp life.

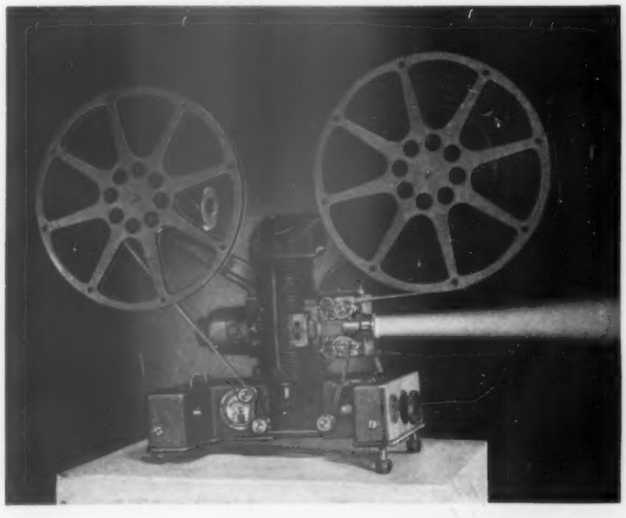
Bell & Howell projectors are very easy to operate. The larger models have interlocked controls which make incorrect operation impossible. This foolproof design means that you can permit its use by student operators and inexperienced teachers.

As for first costs—Bell & Howell prices are not much in excess of mediocre equipment. Moreover, convenient rental-purchase plans are available.

The second factor to be considered—quality movies without eyestrain—you can determine for yourself by watching a Filmo or Filmosound projector in operation. Jump and flicker are noticeably absent, having been completely engineered out of Bell & Howell design. Illumination is brilliant—uniformly brilliant.

These projectors are the result of 29 years of manufacture of the finest precision equipment for the professional film laboratories and motion picture studios. It is only logical that the leading maker of professional and 16 mm. cameras should be equipped to make the finest projectors for visual education.





FILMOSOUND 138 SOUND-ON-FILM PROJECTOR

Projects 16 mm. sound film to audiences of 500 with exceptional clarity and brilliance. Compact—built into a single case. "Flutterless" sound reproduction. High fidelity tone. 1600-foot (45-minute) film capacity. Power rewind. Other Filmosounds for larger audiences, to 1000-watt for the largest school auditorium.

Catalogs and full information on Bell & Howell sound and silent projectors, Filmo movie cameras, the B & H rental-purchase plan, and the Bell & Howell film library will gladly be mailed on request.

FILMO 130 SILENT PROJECTOR

This most powerful of 16 mm. silent projectors provides hour-long uninterrupted performances for the largest school auditorium. Interlocked controls. Variable lamp resistance and voltmeter for longer lamp life. 2-inch F 1.6 lens. Power rewind. 1000-watt lamp.

FILMO S PROJECTOR (SILENT)

750- and 500-watt 16 mm. projectors for classroom and all small audience programs. Priced very reasonably for projectors of Bell & Howell quality.

70398

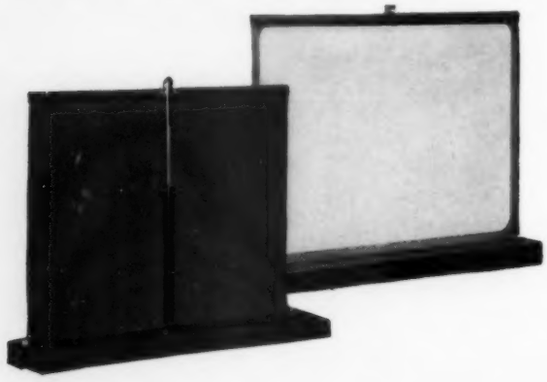
DA-LITE SCREEN CO., INC.

2723 No. Crawford Ave., Chicago, Illinois

The World's Most Complete Line of Projection Screens

SCREENS FAMOUS for QUALITY

Da-Lite Screens, for theatrical and non-professional use, have been famous for their efficiency and the high quality of their material and workmanship for more than a quarter of a century. The Da-Lite line includes white, silver and glass-beaded screens in the world's most complete assortment of sizes and types of mountings, a few of which are illustrated here.

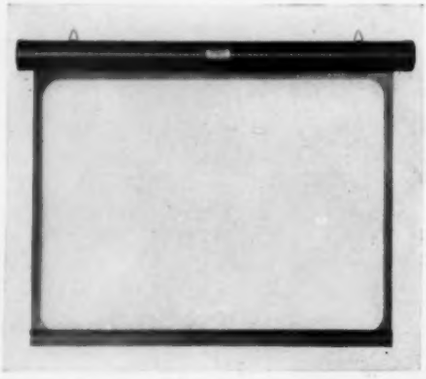


DA-LITE TABLE MODELS

Several popular styles are available for use on desk or table. The New Deal (shown above) is the outstanding leader in the medium priced field. Its exclusive Da-Lite collapsible support locks automatically in place when it is extended to the proper height. The screen, when hooked over the gooseneck of this support, is held in perfect alignment assuring perfect focus of the entire picture. Surface is glass-beaded unless otherwise specified. Ten sizes, 22″ x 30″ to 72″ x 96″ inclusive.

DA-LITE HANGING SCREENS

In science laboratories and auditoriums where permanent installations are advisable, Da-Lite Hanging Screens are recommended. They are available in a wide variety of styles for hanging from walls, ceilings, or special tripods. All have the famous Da-Lite glass-beaded surface unless otherwise specified. Twenty different sizes from 22″ x 30″ to 12′ x 12′ assure a right screen for every requirement. Your dealer will gladly demonstrate. Write for latest catalog.

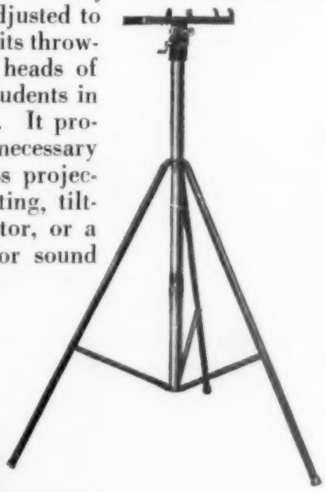


THE DA-LITE CHALLENGER

The most popular portable screen on the market. A tripod pivotally attached to the case permits quick set-up anywhere. Adjustable to height desired. No thumb screws. Top of largest size can be raised 9′ 10″ from floor. Unless otherwise specified, the surface is glass-beaded, assuring brightest, clearest pictures. Seven sizes, 30″ x 40″ to 70″ x 94″ inclusive.

THE DA-LITE PROJECTOR STAND

Classes start promptly when the projection equipment includes a convenient Da-Lite Projector Stand. It can be set up anywhere and adjusted to the height desired. It permits throwing the picture above the heads of the audience and seating students in direct line with the screen. It provides a *steady* support so necessary for vibrationless, flickerless projection. Equipped with rotating, tilting table for silent projector, or a special non-tilting table for sound and slide projectors.



Look for this Trade Mark!

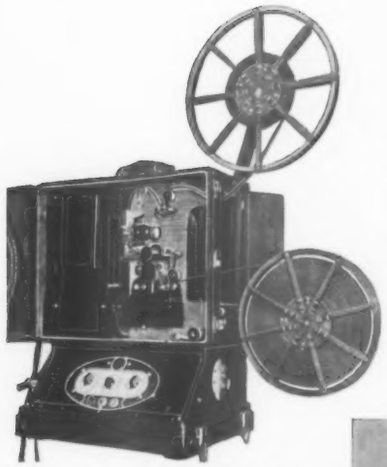
DA-LITE

Reg. U. S. Pat. Off.

It is your assurance of highest quality, perfect projection and long economical service. Catalog on request. Write today!

HERMAN A. DeVRY INC.

1111 Armitage Avenue, Chicago

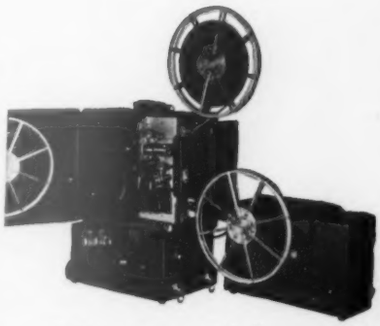


DeVry 16 mm. Sprocket Intermittent Sound Projector

PUBLIC ADDRESS USES

The amplifiers and speakers supplied with all DeVry Portable Sound Projectors come in a separate case from the projector, and can be easily carried anywhere, with microphone, for broadcasting announcements, radio or phonograph musical programs—indoors or out.

With inter-room communication switch panel shown below, all rooms in building can be instantly put in two-way communication with the principal.



DeVry 16 mm. "Challenger" Sound Projector

New Improved 1937 Model THE DeVRY 16 mm. SPROCKET INTERMITTENT SOUND PROJECTOR

This Projector marks a revolutionary advance in sound-on-film projection, adapting the **Sprocket Intermittent** movement, well known to be far superior to the old **claw** movement, in 16mm. machines. To those unfamiliar with the mechanics of projection, it may be explained that the **claw** moves the film by an intermittent downward pull on the perforations, which, where the showings are frequent, soon breaks the perforations, causing loss of loops, jumpy pictures, wear and tear on the film and on the mechanism itself; whereas the **Sprocket Intermittent** is a rotary movement, smooth and uniform always. **All** theatre machines now use the **Sprocket Intermittent.**

NO OTHER SOUND PROJECTOR HAS ALL THESE FEATURES

1. Amplifier and Sound Head Perfectly Matched — both made in same factory.
2. Projector and Amplifier in two separate cases — for Public Address.
3. Reel Arms fold in Case.
4. Easy Treading — plenty of room between idlers and sprockets.
5. Aperture instantly removable for cleaning.
6. Exciter Lamp instantly changed if it burns out.
7. Runs silent as well as sound films at the turn of a switch.
8. Illuminated Control Dials on projector.
9. 750 to 1000 Watt Lamp—the Acme of 16 mm. illumination.

DeVRY 35 mm. PORTABLE SOUND PROJECTOR—FOR LARGER HALLS AND OUTDOOR EVENTS

The 35 mm. portable sound gives somewhat larger pictures and greater volume —and is still portable. This machine shows regular theatre "talkies" on 35 mm. film—and can be furnished in the 2000 ft. magazine model.

DeVRY THEATRE SOUND PROJECTOR

DeVry has revolutionized Theatre Projectors, also—by more **direct** engineering connection between sound and picture elements. Eliminates many useless parts—effecting great saving in first and operating costs.

At the left — THE DeVRY No. 60 16 mm. Movie Camera holds 100 feet of film—Same Engineering design as the famous DeVry "A" 35 mm. News Reel Camera—favorite of News Reel Men the world over, Hollywood Studios, and great explorers and lecturers. Operates At Sound Speed.

Ruggedness to the Nth degree—made for all climates and all emergencies—double counter balanced motor of Swedish Steel—Film gauge prevents buckling—Accurate footage and exposure meter built into camera. Its low price conceals its high quality.

DeVry Sound Recording Cameras—both 16 and 35 mm. widths. For studios, location, News Reel and private sound-picture recordings. Lighter weight—fewer parts —lower cost.

Free folders of any of these items on request . . . also, new booklet: "Values of Movies and Talkies in Education" . . . DeVry School Films . . . DeVry Movie News . . .

WALTER O. GUTLOHN, INC.

35 W. 45th St., New York, N. Y.

THE

LATEST

IN

VISUAL AID

16 MM SOUND-ON-FILM PICTURES

THE GLOBE PROJECTOR

Entire outfit contained in two light, sturdy carrying cases.

Bausch & Lomb optical system. 750 watt projection lamp.

12″ electro-dynamic auditorium sized speaker.

Forced draft ventilation.

Straight line threading.

Central oiling.

1600-foot or 2000-foot reel arms (50 to 55 minutes of show without interruption).

GUTLOHN FILM

A new series of educational subjects under the heading "Our World in Review" produced by **Pathé News, Inc.,** and edited for school use.

Astronomy
Music Appreciation
Art and Architecture
The World and Its People
Physical Science
Marine Life
Microscopic Studies
Hall of Fame
Birds
Wild Animals

Also a classroom series, entitled "SECRETS OF NATURE," in which Micro-photography and moving diagrams are liberally used to enable the students to make detailed observation and analysis of the structure of birds, plants and animals.

Our catalogue lists a great variety of 16 MM. sound-on-film subjects suitable for entertainment and semi-educational purposes. Cartoons, Travels, Musicals, Adventure and full-length feature pictures. Dramatized versions of **"The Last of the Mohicans," "Black Beauty," "Little Men," "Jane Eyre," "The Healer," "Keeper of the Bees," "The Hoosier Schoolmaster."** Write for lease and rental rates.

WRITE FOR DETAILS OF OUR SPECIAL FILM-PROJECTOR PLAN WHEREBY YOUR SCHOOL MAY PURCHASE A GLOBE PROJECTOR ON A DEFERRED PAYMENT PLAN, OR RENT ONE ON A TERM BASIS

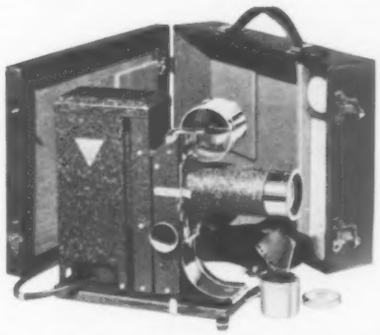
SOCIETY FOR VISUAL EDUCATION

INCORPORATED

Manufacturers, Producers and Distributors of Visual Aids

327 South La Salle St.
Chicago, Ill.

The Society for Visual Education, Inc., has been serving schools and industries since 1919, concentrating on the manufacture of S.V.E. Picturol Projectors (film stereopticons). Only through the Society or its distributors can you be assured of a complete line of Filmslide Projectors from which to choose the one best designed to meet your particular school requirements.

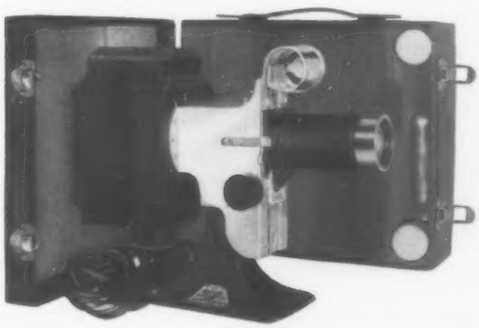


S.V.E. (200-watt) Picturol Projector Model F, with Carrying Case, $48.00

MODEL D

(Illustrated at right below)

This handy, inexpensive S.V.E. Picturol Projector is enjoying growing popularity as a visual aid in the classrooms of the country. It has been in successful use for fifteen years by thousands of teachers who praise it for its convenience, portability and efficiency. The improved Model D, here illustrated, provides increased illumination, recessed film track, noiseless operation and extreme compactness, and is offered at the low price of only $38.50 complete with carrying case.



S.V.E. (200-watt) Picturol Projector Model D, with Carrying Case, $38.50

All S.V.E. Projectors can be fitted for rural service on battery current.

MODEL F

(Illustrated at left)

Model F Projector, the latest development in the single frame field, is the only manually operated projector having a rear aperture glass releasing mechanism—a patented S.V.E. feature used successfully for a number of years in the S.V.E. Automatic Projector. This feature materially protects the emulsion of the film. The large film magazine will accommodate up to four hundred frames of film. Film track and magazine are nickel-plated and recessed throughout. The illumination is superior to that of any other 200-watt projector in this field—ideal for classroom use. Price, with carrying case, $48.

PROJECTION SCREENS

We carry a full line of beaded and aluminum-coated special projection screens for use on tables or for hanging on walls or tripods. These come in a number of sizes and in mountings to meet all requirements. Prices range from $5 up.

FILMSLIDE SUBJECTS

An extensive library of Picturol Filmslide subjects is available covering the following courses:

Archaeology	Literature
Ancient History	Latin
Agriculture	French
Art	Spanish
Biography	Music
Chemistry	Nature Study
U. S. Geography	Physical Education
Foreign Geography	Physics
Industrial Geography	Primary Reading
Physical Geography	Safety
Health	Travel
Home Economics	U. S. History

Write today for further information.

DOUBLE-FRAME PROJECTOR

For those who are making their own filmslides with any of the double-frame candid cameras, the S.V.E. Tri-Purpose Projector, Model BB, is offered, complete with carrying case, at $30. Also projects single-frame filmslides and individual frames mounted in 2 x 2″ glass slides.

THE AUDIO-VISUAL HANDBOOK

by Ellsworth C. Dent

Completely revised. A General Up-to-date Directive

Order your copy now

$1.25 Paper Cover POSTPAID $1.75 Cloth Bound

THE AMERICAN SCHOOL AND UNIVERSITY

SPENCER LENS COMPANY

Buffalo, New York

Manufacturers of

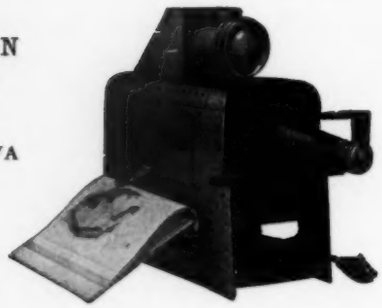
Microscopes — Microtomes — Delineascopes

BRANCHES

New York | Chicago | Boston | San Francisco | Washington

SPENCER COMBINATION CLASSROOM LANTERN

Model VA



Spencer Model VA is designed for the projection of post-cards, photographs, drawings, etc., interchangeably with glass slides. The change from one to the other is instantaneous. By the addition of a Filmslide Attachment you may also use both filmslides and microscope slides, making this **a four-purpose lantern** at an unusually low price.

The Model V series was built especially to meet classroom conditions; consequently it is compact, portable, easily operated and truly efficient for daily class work. It permits the use of all available illustrations so that the teacher may economically develop his own library.

This model may also be had as an opaque projector only, at a price never before offered for such an outfit. This group is for direct projection on an opaque screen.

These classroom lanterns are furnished with or without a blower. The blower is advisable to protect the opaque material from heat damage if the material is to be held in place more than a few minutes.

COLOR PLATE PROJECTORS

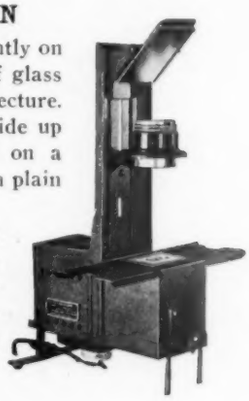
Spencer Model DK was designed especially for protection of natural color plates and other valuable slides.

A motor-driven blower directs a blast of COOL air to the condenser chamber and to the slide, doing away with the objectionable water cell, heat-absorbing glass or other so-called method of eliminating heat.

Model DK is easily portable, simply operated and insures marvelous screen results. Accommodates color plates from 4.5 x 6 cm. up to 3¼″ x 4¼″. An excellent outfit for use in classrooms, small lecture halls and the home.

Two larger outfits of this same general design are available for auditorium use and where the larger color plates are used. Model JK accommodates slides up to 4″ x 5″ and the Model LK up to 5″ x 7″.

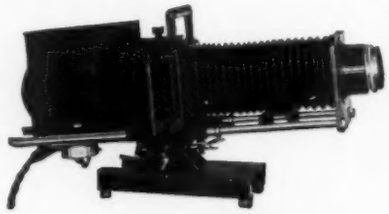
LECTURE TABLE LANTERN



Spencer Model B—placed permanently on your lecture table permits the use of glass slides during any part of your lecture. Slides are placed on carrier right side up to the lecturer and are projected on a screen hung above and behind him, in plain view from any part of the room.

By using a pencil as a pointer it too will be projected, thus indicating to the class the item under discussion. May be used without preliminary set up. Indispensable for class use. The Spencer Model B is efficient and inexpensive.

CLASSROOM LANTERN



Spencer Model D, for the projection of glass slides in regular class work, embodies several special features incorporated in the design for the conveniences of the teacher. It has non-heat conducting carrying handle; **double** tilting device for properly locating screen picture at any desired angle; reading aperture in side of lamphouse; special condensers and lamp insuring remarkably brilliant illumination.

May be used successfully on wall or blackboard as well as screen.

Addition of a Filmslide Attachment gives a three-purpose lantern in one projector. To change from glass to filmslides takes 18 seconds and from filmslides to micro-slides, 5 seconds. This provides the most inexpensive and efficient combination outfit available.

VICTOR ANIMATOGRAPH CORP.

Manufacturers of 16mm Cameras, Projectors (Silent and Sound)
Stereopticons and Slides

General Office and Factory: Davenport, Iowa

BRANCHES IN: Chicago Los Angeles New York City

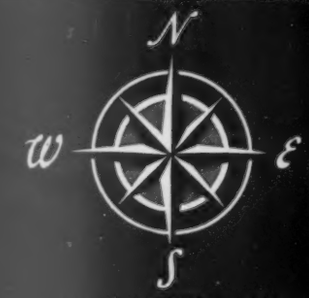
ANIMATOPHONE

. . . WORLD'S MOST WIDELY USED 16mm SOUND PICTURE PROJECTOR

NOT AT ANY PRICE can these, and other valuable features responsible for Animatophone leadership, be had in any Sound Projector other than

VICTOR

****AUTOMATIC SAFETY TRIPS that prevent costly film mutilation (endorsed by all film libraries) . . Easy to clean SUPER SOUND SYSTEM that insures perfect performance always . . . SUPER HI-POWER ILLUMINATION with QUIET, SPIRA-DRAFT VENTILATION that prolongs lamp LIFE and EFFICIENCY . . . Simple, sturdy construction . . SUPERIOR SOUND and Unsurpassed PICTURE QUALITY. For definite PROOF, ask to see and hear ANIMATOPHONE perform. Why not NOW?



★ In CCC CAMPS and U. S. FORESTRY SERVICE the sturdy, "fool proof" easy-to-use Animatophone has practically excluded all other 16mm sound equipment.

★ In INDUSTRY, light weight, compact and efficient Animatophone, with its many superiorities, has won a prominent-user following that has no equal.

★ In the service of SCHOOLS, UNIVERSITIES, and CHURCHES Animatophone outnumbers all other 16mm sound projectors by a decidedly substantial margin.

★ On SHIPS sailing the seven seas—on TRAINS entertaining passengers with sound pictures — 16mm Animatophone knows no competition, for it alone provides finest reproduction, trouble-free performance and absolute safety along with Automatic "cut-off" Protection Against Film Mutilation. North, East, South and West — At Home and Abroad — ANIMATOPHONE'S all-round SUPERIORITY has made it the great popular choice!

REMINGTON RAND INC.

Buffalo, N. Y.

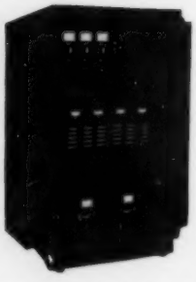
BRANCH OFFICES

Albany	Harrisburg	Philadelphia
Atlanta	Hartford	Pittsburgh
Baltimore	Houston	Portland, Ore.
Birmingham	Indianapolis	Providence
Boston	Kansas City	Richmond
Chicago	Los Angeles	Rochester
Cincinnati	Milwaukee	Sacramento
Cleveland	Minneapolis	San Francisco
Columbus	Newark	St. Louis
Dallas	New Orleans	St. Paul
Denver	New York	Seattle
Des Moines	Oklahoma City	Syracuse
Detroit	Omaha	Washington, D. C.

AND ALL OTHER PRINCIPAL CITIES

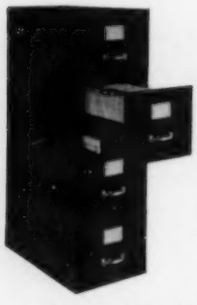
CERTIFIED RECORD PROTECTION EQUIPMENT

SAFE-CABINETS



Scientific research and tests conducted by the Safe Manufacturers National Association definitely proved that, in most cases, safes built prior to 1917 are obsolete, and as such, cannot afford adequate protection to papers against fire. Remington Rand SAFE-CABINETS comply fully with the rigid standards set by the National Fire Protection Association, the Underwriters Laboratories, the Safe Manufacturers National Association, and also the federal specifications of the U. S. Bureau of Standards. SAFE-CABINETS can be had for 4 hr., 2 hr., and 1 hr. protection against fire. Obtainable in many sizes with a wide variety of interior fittings. May be equipped with slide-in doors.

SAFE-FILES



To give filed papers the protection equal to that of a safe is the purpose of the Remington Rand SAFE-FILE. An all one-piece insulation supplemented by heavily insulated tongued, grooved and gasketed drawerheads offsets violent attacks by fire. The rigid, strongly-built suspension prevents any sagging of the drawer even when fully extended and loaded to capacity. It easily carries loads ranging from fifty to seventy-five pounds exclusive of drawerweight.

SAFE-FILE inserts are of two types—drawers and removable trays. Both types can be used in both Letter and Legal size SAFE-FILES. Takes 5 x 3, 6 x 4, and 8 x 5 Card Tray Inserts. Available in 2, 3 or 4 drawers, Letter or Legal size. All units have a net capacity of 25⅛ in. Bear Safe Manufacturers National Association label.

SAFE-LEDGER TRAYS

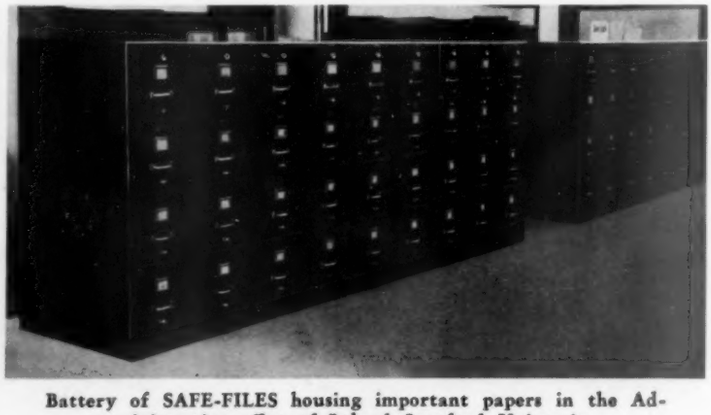
New 2 hour SAFE-LEDGER TRAY and new, improved 1 hour SAFE-LEDGER TRAY bring certified protection against fire to records at point of operation. New 2 hour Tray is capable of withstanding torrid heat reaching 1850 degrees Fahrenheit without damage to papers. All sides thoroughly insulated. Overlapping drawerhead. Portable. Self-locking lock. Removable inner tray automatically rises with cover. Three filing depths: 15⅜", 18", and 18⅜", all adjustable to four different heights. Each model accommodates any sheet width up to 21". Both models bear Safe Manufacturers National Association label. Available in either sitting or standing heights.

VAULT DOORS

Remington Rand VAULT DOORS possess the same superior construction features which are standard on modern SAFE-CABINETS. Insulation, tongues, grooves and gaskets are alike. All doors are designed for installation in vaults having a minimum wall thickness of 10 inches and are of the raised sill type with continuous tongues and grooving on **all four** sides. Highly insulated and rigidly braced, these doors offer safe, dependable resistance to heat conduction, buckling and warping. Available with Safe Manufacturers National Association label for 6 hours, 4 hours and 2 hours. The 6 hour and 4 hour doors bear the Underwriters Laboratories label.

REMINGTON RAND RECORD PROTECTION PRODUCTS

SAFE-CABINETS
SAFE-KARDEX
INSULATED CARD FILES
SAFE-LEDGER DESKS
SAFE-LEDGER TRAYS
DRAWER SAFES
SAFE-FILES
CERTI-FILES
INSULATED VAULT DOORS



Battery of SAFE-FILES housing important papers in the Administrative office of Leland Stanford University

"LIBRARY BUREAU" LIBRARY EQUIPMENT

BOOK SHELVING

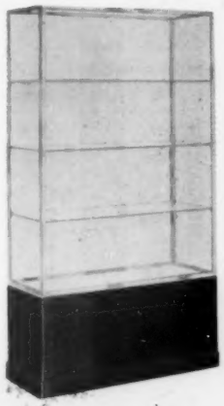
For more than a quarter of a century Library Bureau unit wood book shelving has given continuous and satisfactory service. Shelving, either five or seven shelves in height, 3' wide on centers, allows for a wide interchangeability of shelves. Shelves are three depths: 8", 10", and 12", and adjustable in height. As wood shelving can be furnished to match the trim of the room, it is generally preferred. Steel bookstacks can be furnished when desired.

LIBRARY TABLES

The beauty of a Library Bureau table is in the selection of wood, the finish, and the graceful proportions. Tops are built up of five-ply construction with a special process that insures against cracking, warping, or splitting. All edges are rounded to prevent slivering or splintering. Special sizes or designs are made to order.

CATALOG CASES

Whether the need be for a single case or a whole battery of units, Library Bureau Catalog Cases are the most satisfactory, because of their compactness and ease of operation. Trays are extremely rigid and strong without excessive weight for handling. Accuracy of construction provides for interchangeability of trays. All trays are equipped with positive followers, and with rods. A typical example is the model No. 23360-R shown above. Unit card catalog cases in five, ten, and 15-tray sections allow for expansion and still maintain the appearance of a single cabinet.



CHARGING DESK

A charging desk scientifically planned and well constructed affords permanent satisfaction. Library Bureau desks in either counter or sitting height are all designed to house the materials used in charging and discharging with proper arrangement to provide maximum convenience for both patron and attendant. Special desks for unusual requirements are made to order.

ADJUSTABLE MAGAZINE RACK

A magazine rack that is different, providing a new method of housing magazines alphabetically in an orderly manner—easy to find—easy to replace. It accommodates 35 magazines. Label holder at the top of each holder identifies the magazine and insures proper replacement.

REMINGTON RAND TROPHY CASES

The Remington Rand Trophy Case can be had in either aluminum or bronze. Narrow frames provide a maximum display space, yet do not detract from the beauty of the surroundings. Cases may be provided with light fixtures to afford proper illumination of contents. The typical case illustrated has glass on ends, top, front and has adjustable plate glass shelves. The front is hinged to allow for access.

Standard Library equipment is carried in stock in quarter-sawed white oak. Equipment of other woods or of special designs may be furnished on request. For more detailed information in regard to construction or dimensions, send for catalog.

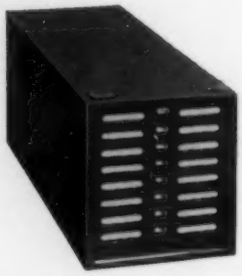
Full sweep of complete Remington Rand Library Equipment servicing the library of Brooklyn Technical High School, Brooklyn, N. Y.

REMINGTON RAND INC. ADDITIONAL LIBRARY EQUIPMENT AND SUPPLIES

- Steel Book Shelves
- Section Label Holders
- Unit Shelving Combinations
- Book Cases
- Office Desks
- Round Library Tables
- Sloping Top Tables
- Library Chairs
- Card Catalog Cabinets
- Information Files
- Newspaper Racks
- Dictionary Stands
- Bulletin Boards
- Book Trucks
- Waste Baskets
- Exhibition Equipment
- Wardrobe and Supply Cabinets
- Overdue Postcards
- Non-Loseable Book Supports
- Poster Holders
- Date Slips
- Celluloid Picture Holders
- Librapaste
- Lock Binders
- New Thrift Pockets
- Accession Books
- Application Cards
- Charging Trays
- Charging System Guides
- Periodical Record Cards
- Vertical and Visible Filing Supplies
- Mending Tools and Materials
- Rubber Dates

ADMINISTRATIVE SYSTEMS AND EQUIPMENT

KARDEX CABINETS



Kardex Cabinets are available in many card capacities. Each Cabinet is a unit in itself but can be built up with other units to form a perfect, uniform battery. All standard card sizes. Sliding trays operate easily, and may be removed when desired. Pockets can maintain two or more related forms. Thus, many combinations can be worked out for folding or overriding cards. Lock, controlling sliding trays, is optional. Cabinets may be had in olive green, walnut, mahogany, or Krinkle black finishes. Durably built for long and satisfactory service.

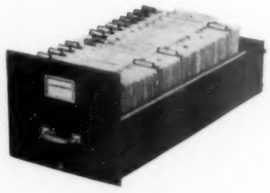
BUDGET CONTROL CARD

Here is a card that can be used to excellent advantage by Board of Education Officials, School Superintendents, Principals, and Department Heads. Available in standard sizes, card fits pockets of Kardex Cabinet slides and Zipper Book Units. Buff color denotes ordinary accounts; salmon color is used for totaling amounts in each group. Colored progressive signal flashes amounts and percentages of budget expenditures, including the month up to which appropriations have been used. Card is double-faced with last year's record recorded on back for comparison with this year's record which is kept on the front. Thus, a closer check may be kept on the present year's expenditures, month for month, with those of the previous year.

"NORMANDIE" DESKS

"NORMANDIE" 3000 Line-Steel Desks provide all the advantages of steel equipment at no extra cost. Beautifully designed and durably built, these desks will give long and satisfactory service. Top is single-sheet, 18 gauge steel, heavily reinforced. Stainless steel bindings protect the beveled edges of linoleum covering. Sides and backs of pedestals are formed from one sheet of metal. Interior framework and bracings are welded. Rigid steel legs correctly proportioned. Drawers operate silently on new suspension principle. All drawers are controlled by center drawer which has grooved lock. Available in all standard sizes and finishes.

VARIADEX



Variadex is unique in that it brings greater speed, flexibility, and efficiency to filing. It may be synchronized with the flow of papers, expanding or decreasing with no loss of efficiency.

Variadex sets are available in many alphabetical subdivisions, ranging from 25 letters to one that divides the alphabet into 10,000 units.

Another feature of this system is the use of color as an aid to controlled selectivity. Striking colored tabs, easily recognized at a glance, permit greater precision in filing and finding. They also enhance the appearance of a file and act as a check on errors. Especially recommended for large-volume filing.

KARDEX STOCK CONTROL CARDS

Kardex Stock Control Cards fit both Kardex Cabinet slides and Kardex Book Units. Card setup allows for complete history of stock movement. Spaces provided for recording date received, quantity, date issued, amount, and balance left in stock. Visible signals disclose when minimum is reached, or when stock reaches depletion point. This makes for intelligent replenishment and averts unnecessary delays.

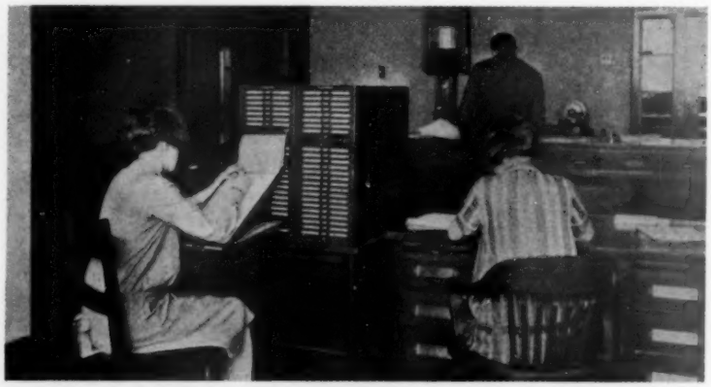
KARDEX STUDENT RECORD CARD

Kardex Student Record Cards are designed to give, quickly and accurately, the complete school history of every registered student. Principals and other administrative officers find this system of visible control invaluable to the smooth functioning of the school program. A glance at the card instantly tells what students are falling behind in their classes, those who need extra help, or merit rapid promotion. Kardex reveals the consistently tardy or absent pupil, those in need of medical attention, the "I. Q." of every student; in short, his or her complete record from first grade to graduation from Senior High School. A student's permanent record may be called on by his teachers, parents, prospective employer, and even the student himself. Copies may be sent to colleges requesting student's complete record.

REMINGTON RAND ADMINISTRATIVE SYSTEMS AND EQUIPMENT

Filing Cabinets
Filing Supplies
Card Record Systems
Visible Reference Equipment
Visible Binders
Office Furniture
Lockers
Steel Shelving

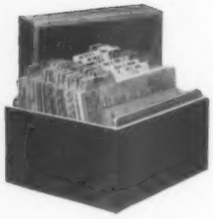
SEND FOR NEW BOOKLET—"SCHOOL RECORDS AND EQUIPMENT"



Remington Rand Administrative Equipment and Supplies in the Administrative Office of the Academy High School, Erie, Pa.

COMMERCIAL CLASSROOM EQUIPMENT

PRACTICE FILING OUTFITS



Remington Rand's Library Bureau Practice Method of Teaching Filing is unique in that it brings the student into direct contact with actual filing work. "Learning by doing" is the guiding principle of this new plan of learning to file. Students of this course first familiarize themselves with the essential rules of indexing. Then they apply these rules by becoming "file clerks" in a fictitious New York City company. They file miniature correspondence in miniature folders behind miniature guides. Thereby, learning to master the intricacies of the various forms of filing.

PROGRESSIVE INDEXING AND FILING TEACHERS' KEY AND TEACHERS' GUIDE

Written in a clear, comprehensive manner, "Progressive Indexing and Filing" furnishes an outline and supplementary material for the practice course in filing. Carefully planned, progressive steps, from elementary essentials to the more advanced phases of filing, aid the teacher who conducts the course. Pertinent questions at the end of each chapter suggest points for class discussion and recitation.

Supplementing this text are a Teachers' Key and Teachers' Guide. Both booklets serve as an aid in presenting the subject of filing. They also assist in checking and measuring the work which the students perform with the practice outfits.

VISIBLE RECORD OUTFITS

New Remington Rand practice method is designed to acquaint students with the fundamentals of visible record control. Each pupil works with a model visible system, sets up the record, makes entries, establishes a visible signal control and draws conclusions from the posted facts. A full-sized 6-tray Kardex Cabinet is furnished. Five of the slides are fitted with cards illustrating personnel, prospect, stock, ledger and sales records. The sixth slide has Kardex pockets only. Teacher's task made easy by following authoritative textbooks and guides. Schools purchasing a complete set of visible record equipment are entitled to a free correspondence course and Question and Answer service.

ALPHABETIC INDEXING AND FILING WORK BOOK

A new Work Book supplements the textbook, "Progressive Indexing and Filing." Contains definite rules and standard practice instructions conducive to simplified filing methods observed in business offices. Material written in clear, thorough manner, easy for students to absorb. Over 100 job lessons carry students through all phases of indexing and filing. Large quantity of perforated sheets follow job assignments. Each sheet in turn perforated to make six filing slips. Slips can be used as cards.

Students working on Vertical Practice Filing Outfits, Commercial High School, Atlanta, Ga.

REMINGTON RAND CLASSROOM PRODUCTS

Textbooks on Visible Record Keeping

Textbooks on Filing

Practice Equipment for Teaching Filing

Demonstration Material for Office Practice

Bookkeeping Instruction Equipment

SIGHT CONSERVATION EQUIPMENT

TYPEWRITERS WITH LARGE TYPE NOW USED BY PROGRESSIVE SCHOOL SYSTEMS IN SIGHT CONSERVATION CLASSES FOR CHILD EDUCATION IN PRIMARY AND ELEMENTARY GRADES FROM COAST TO COAST.

EMINENT EDUCATORS ENDORSE LARGE TYPE MACHINES AS ESSENTIAL TO PROGRESS OF THOUSANDS OF PUPILS IN LOWER GRADES WITH POORLY DEVELOPED EYESIGHT.

"WORK IS BROUGHT CLOSER TO STUDENTS WITHOUT EYE-STRAIN."

MACHINES ALSO USEFUL FOR PREPARATION OF BULLETINS, PROGRAMS, TEST PAPERS, MENUS, SEAT WORK, AND KINDERGARTEN ACTIVITIES

Remington Large Primer Type No. 47

Letter Spacing - Eight to the inch

LARGER PRIMER . . . especially well adapted for kindergarten use, first and second grades. Equally effective for pupils in intermediate grades who have subnormal vision. Dr. Thomas D. Wood of Columbia University states that, "Approximately 3,000,000 children in the United States, one eighth of the entire school population, are handicapped in their education by defective eyesight."

Remington Magnatype No.105

Letter Spacing 6 to inch

MAGNATYPE . . . the all-around type, endorsed by the National Society for Prevention of Blindness, for general use. Cuts better stencils, and is much in demand by teachers. Over 150 large-type machines are used in the 92 sight conservation classes in New York City.

This is Double Case Bulletin Type excellent for bulletins and notices.

BULLETIN . . . as shown, Bulletin is well suited for making bulletins and notices. Excellent for work copies. Work is much more legible and easily preserved for filing and future reference. Los Angeles schools use over 400 machines equipped with these large type styles.

FOR MOVIE TITLES, NEWS BULLETINS, & SIMILAR WORK.

LARGE BULLETIN . . . preferred where messages must be read from distances, such as movie titles, screen slides, and posted bulletins. Used in extremely substandard cases.

We are glad to be here.
We are glad to be here.

Ww ane glad to be here.
We are glad to be here.

Martha Jane Watson
Age 7

juyj jmnj jmnj kik
dedcd swsxs aqazza
lol.l ;p;/; frtf f
jhfg kik,? jjjjjj

Once there was

Alice. She lived

Near the house was

where Alice played.

Characteristic of the work accomplished in the Primary and Elementary grades are these two specimens (one shown only in part) of seat work typed by two first grade pupils. The touch method of typing was used exclusively. Emphasis was placed on accuracy and neatness. Students had normal eyesight.

Remington Rand typewriters, No. 16 and Portable models, are equipped with large sized type. Magnatype 105 and Bulletin type 48 are endorsed for Sight Conservation by the National Society for Prevention of Blindness. Primer types are recommended for general use. Type obtainable in either double or single case letters. Both the Model 16 and the Portable operate smoothly and quietly. A child in kindergarten can operate either with a minimum of effort. Durably built to stand hard abuse. All known typewriter improvements make these machines essential to any curriculum having to do with typing or Sight Conservation. Further details furnished on request.

Primary grade pupils doing seat work with Remington Portable typewriters

ART METAL CONSTRUCTION COMPANY

Jamestown, New York

BRANCH OFFICES

Albany, N. Y.
Baltimore, Md.
Boston, Mass.
Chicago, Ill.
Cincinnati, Ohio
Cleveland, Ohio
Detroit, Mich.
Hartford, Conn.
London, England
Kansas City, Mo.
Los Angeles, Cal.
Memphis, Tenn.
Newark, N. J.
New York City, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Washington, D. C.

600 SALES AGENTS IN ALL PRINCIPAL CITIES

FOREWORD

SCHOOL and university administrators and architects are aware of the function which proper modern equipment plays in a progressive educational environment. As manufacturers of such equipment we recognize our obligation to the school and to the architect—the obligation to study school requirements and to produce equipment scientifically designed to serve such requirements; to insure the quality of the product; and to co-ordinate increasingly the improved product with the improved practices in education.

The Art Metal Construction Company, Inc., has prepared in the following pages a functional application of its products and services to modern school building situations. The scope of its furniture—from the most modern desks, tables, bookcases, safes and visible files for the administrative office to special equipment for the library, corridor, laboratory, shop, lecture rooms, and storeroom—is an illustration of its wide interests and services.

The services of our consulting staff are available to architects or educational executives who may wish assistance in the planning of school administrative office, libraries and other departments.

FOR THE ADMINISTRATIVE OFFICE

- Cards for Record Keeping
- Filing Cabinets
  - Letter Files
  - Card Files
  - Counter-Height Files
- Desks
- Office Counters and Tables
- Safes

FOR THE CLASS ROOM

- Storage Cabinets
- Tables
- Bookcases
- Blackboard Partitions
- Wardrobe Cabinets
- Steel Lockers

POSTINDEX VISIBLE FILES

- Student Permanent Scholastic Record
- Health Record
- Student Program Record
- University Student Analysis and Guidance Record
- Attendance Record
- Student Employment Record

FOR THE LIBRARY

- Bookcases
- Bookstacks
- Cabinets
  - Filing
  - Storage
- Card Catalog Drawers
- Cards, Record-Keeping
- Counters
- Counter-Height Files
- Desks
- Doors—Metal
- Glass-door Shelving
- Lockers
- Newspaper Holders
- Newspaper Racks
- Museum Cases
- Shelving
- Tables
- Wardrobes

ART METAL FOR THE ADMINISTRATIVE OFFICE

MODERN FILING CABINETS

Art Metal cabinets have kept pace with the times. Producers of steel office equipment for nearly fifty years, Art Metal offers a product which is the result of scientific research and sound engineering. Features incorporated include: All-welded construction, latest cradle-type suspension, locking device, friction clutch compressor, bronze hardware, quick-action thumb latch, snap-out guide rod and rubber silencers. Olive green is the standard finish. Mahogany, walnut or oak graining is obtainable at a slightly increased price.

Letter Files
Card Index Files
Cap Files

Document Files
Check Files

Transfer Cases and Files for all standard forms. Catalogs on request.

"1500" LINE DESKS

Working convenience, strength of construction and attractiveness of design have been incorporated in the Art Metal "1500" Line Desks to give the utmost in desk value. Only a manufacturer with Art Metals' facilities could place a desk of this quality on the market at its present price. "Artolin" tops, bronze drawer pulls and footings, easily working and conveniently arranged drawers are features of this line. The lock control is located in the knee space. Thirty styles and types of desks and tables for all school office work. Catalog on request.

FIRE SAFES

Protection of vital records is necessary in the registrar's, bursar's and superintendent's offices. An increasing number of school and university executives are recognizing the need and are obtaining the security which comes with installation of Art Metal safes. These safes carry Underwriters' inspection labels. Class AT-20 indicates the safe is effective in withstanding severe fire (reaching 2,000° F.) for at least four hours before interior temperature reaches 300° F. and in withstanding while in highly heated condition, impact due to falling 30 feet in the clear. Class BT-20 indicates the safe is effective in withstanding the same temperature for a two-hour period with the same impact test. Underwriters' T-20 designation which qualifies the safe as secure against all usual attack except use of explosives. Ten safes in seven different cubic capacities comprise Art Metal A and B model safes.

ART METAL FOR THE CLASSROOM

SPACE-A-SHELF UNITS

Art Metal Shelf-a-Space Units offer extremely low cost book storage with good appearance. These units have detachable ends which results in space saving where several units are placed side by side. The standard library shelves with which these units are equipped are slotted to provide easy adjustment without fastening. They may be shipped or moved K.D. but are permanently rigid when assembled. The standard finish is Art Metal Olive F, although any plain or grained finish may be had at small extra cost. (Illustrated at left.)

STORAGE CABINETS

Prevent the continuous loss of time and of office supplies by providing Art Metal storage cabinets. Inventory keeping is greatly aided by having a place for every form and item of supply. Art Metal Cabinets cost but a portion of the savings they make possible. In schools everywhere they are being used for storing supplies, file binders, books, hats, coats and hundreds of other miscellaneous items. Whatever the need, there is an Art Metal Cabinet to meet it. Ask for Catalog of Storage Cabinets.

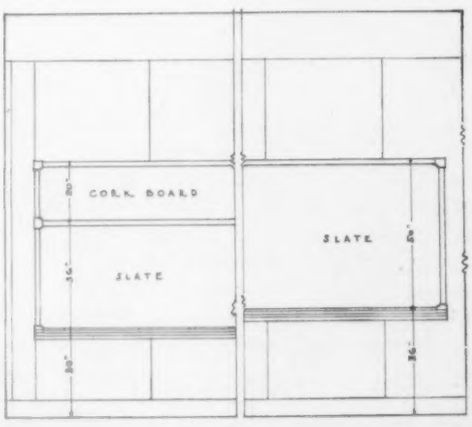
BOOKCASES

Art Metal Sectional Steel Bookcases are sturdily built and are equipped with disappearing glass doors with a new channel and roller construction which operates smoothly and easily. All sections, tops and bases are attractively and durably finished in Art Metal Olive, Mahogany, or Walnut. If the need is for book storage at a lower cost Art Metal manufactures Space-a-Shelf Book Units. These have detachable ends and standard library shelves. Slotting provides easy adjustment without fastening. These may be shipped knocked down but are permanently rigid when assembled.

ROOM AND OFFICE PARTITIONS AND BLACKBOARD FRAMES

Art Metal Vertical Unit, flush type sound-proofed, partitions are especially adapted for school use.

Modern blackboard equipment demands a frame which is strongly constructed and at the same time of attractive appearance. The accompanying sketch shows standard type Art Metal blackboard frame on the right. On the left is a combination frame providing for a corkboard bulletin space immediately above the regular chalk writing space. Catalog on request.



POSTINDEX VISIBLE FILES

For School and College Records

STUDENT PERMANENT SCHOLASTIC RECORD FOR PUBLIC SCHOOLS—C-4077-P

This is a four-page card providing for record of grades earned by student during Elementary, Junior and Senior High School. In addition, this four-page form includes general information about the student, information about parents, with a record of school activities, athletics, special abilities, standardized tests and educational plans, such as is being demanded by modern trends in education.

HEALTH RECORD FOR PUBLIC SCHOOL STUDENTS —C-4076

This four-page form is of the type needed in connection with periodic health examinations and follow-up of treatment. One page of this form is designed to particularly cover additional items required in the examination of High School students. Space is also provided for record of illness absences and treatments.

STUDENT PROGRAM RECORD—B-2027-8-P

This is a typical example of card used to show student's program by days and periods.

UNIVERSITY STUDENT ANALYSIS AND GUIDANCE RECORD—OG-0154-8

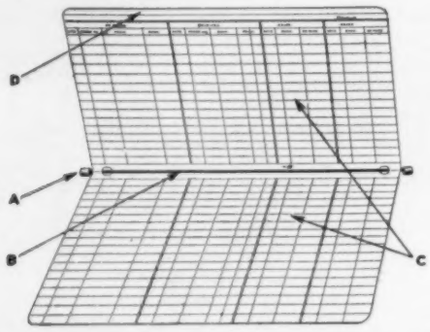
This record is typical of records now being used in Universities and Colleges for guidance and vocational analysis. The four-page form, 8 x 10½ when folded, gives liberal space for recording information such as social history, preparatory school background, college activities, personality development, vocational experience, vocational ambitions and educational counselling record.

UNIVERSITY AND COLLEGE STUDENT ATTENDANCE RECORD—C-4676-8

This four-page card has found favor among several Universities and Colleges for complete attendance throughout the college year. One of the back pages provides for information on outside activities and the other back page is horizontally ruled for special notes.

UNIVERSITY AND COLLEGE STUDENT EMPLOYMENT RECORD—C-4687-8

This form is used by leading Universities to take care of problem of providing employment for student while attending school. It provides sufficient information for an analysis of student's qualifications and also devotes space to follow-up of employment.



THE SIMPLICITY OF THE POSTINDEX VISIBLE FILE PRINCIPLE

A. This is the trunnion that operates in the channel at the side of the panel.

B. This is the anti-rust tempered spring wire card holder. Form may be inserted or removed from panel instantly.

C. This shows two pages of the four-page form, which gives a writing area on an 8 x 5 inch form of 160 square inches, equal to a ledger page of 10 x 16 inches.

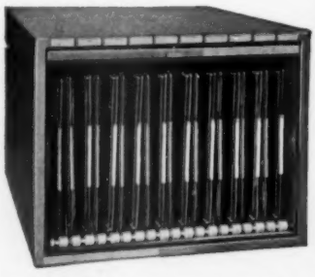
D. This shows the visible line where are typed the name and address or the subject of the record.

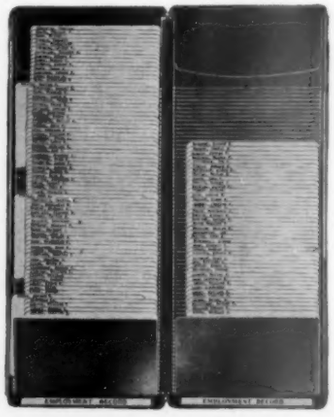
POSTINDEX DRAWER CABINET VISIBLE FILE

POSTINDEX cards are always ready to use. There are no clips to be added. No holes need be punched. No edges need folding over. The cards require no glued-on tabs. After typing or writing the student's name and other information necessary, it takes but a moment to insert the wire in the holes and snap it into the panel frame where the record stays ready to serve instantly.

Changes and additions are quickly and easily effected in POSTINDEX files because of the exclusive POSTINDEX card holder. The user needs but to snap it out or in. POSTINDEX offers the fastest record changing medium on the market. If the records are kept up-to-date by ink, the left hand can find the cards desired while the right hand enters the information. The right hand need never lay down the pen.

Just as the pace of today's business demands the best methods, so does the constant intake and graduation of students in schools require the most convenient and swiftest device for keeping grades and noting changes. POSTINDEX solves the problem as no other system or device.



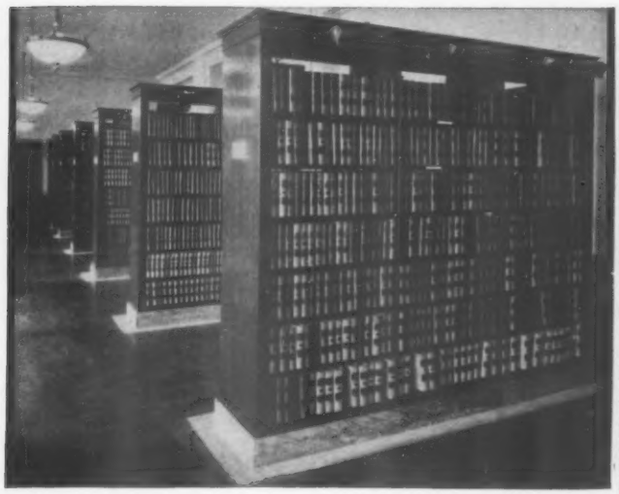


Adaptable to Any Record. Four Types of Cabinets

POSTINDEX FLAT-BOOK VISIBLE FILE WITH CABINET

Imagine a book of 300 or more pages, so condensed and so well organized that you would know, simply by opening the cover, exactly what you would find on every page of the book! A single POSTINDEX Flat-Book makes an average bookful of record information as available as that. A sufficient number of them will give the superintendent an instant picture, vivid as a photograph, of the entire school registration.

ART METAL FOR THE LIBRARY



BOOKSTACKS

Art Metal Library equipment is used in many schools and universities as well as in a large percentage of the modern libraries in this country. Shown in the accompanying illustration is a series of bookstacks of Art Metal construction. These are the free-standing, two-faced type. Also in popular use is the superimposed self-supporting tier type of stack. In this type bookstack each tier is separated by a deck floor which is supported by the tier or tiers beneath.

MUSEUM CASES

Shown above is a recessed wall case recently installed in a new school building. Cases of this kind are particularly advantageous in displaying educational exhibits. The above case is about twelve feet long and is equipped with semi-indirect lighting which emanates from behind the central pilaster. It has sliding doors. These cases can also be furnished with doors hinged at the top or side and also with panels which are removable.

ART METAL AIRLINE DESKS

For School Offices

FEATURES

- New Unique Beauty
- Highly Functional
- Concealed Wiring
- Convenience Tray
- Removable Card Trays
- Adjustable Vertical Drawer Partitions

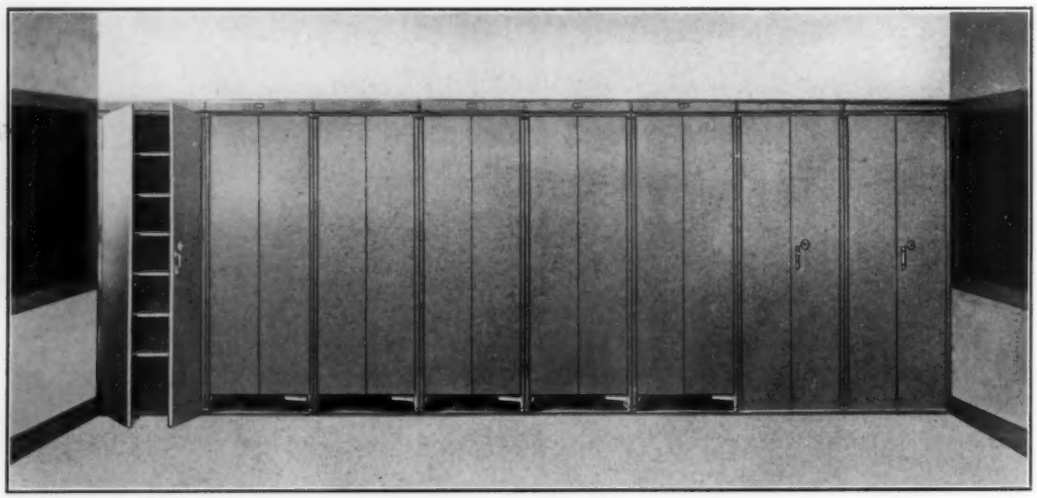
Style 1760 F.B.

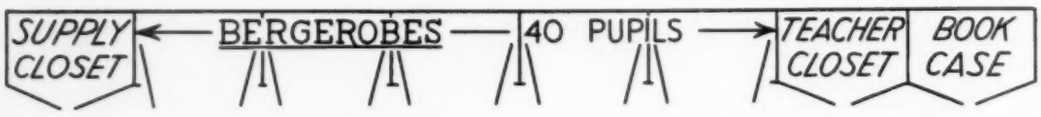
The keynote of beauty in Art Metal's new desk creation is obtained by the gracefully rounded edges, Island Bases under each pedestal, black Artolin top with White Satin finish hardware. All metal desk improvements, evolved during Art Metal's fifty years of pioneering in the metal desk industry, have been incorporated into these desks. Provision has been made for concealed wiring. A convenience tray for stenographic supplies may be inserted in place of one sliding reference shelf. The "In-Desk" tray provides two compartments for letter size papers and one to hold legal size papers. Top tray of the series of three may be lifted out and used as a desk top tray. Adjustable vertical partitions for division of drawer space make convenient compartments for stationery. Other desks in this popular group are: Fixed Platform Typewriter Models (single and double pedestals); Single Pedestal Clerical Model; Secretarial Model with Typewriter in either Pedestal; Drophead Platform Typewriter Models (single and double pedestals). Catalog sent on request.

THE BERGER MANUFACTURING CO.

DIVISION OF REPUBLIC STEEL CORPORATION

Canton, Ohio





BERGEROBES Provide a Modern Method for Safeguarding Children's Apparel

Doors Closed

A BERGEROBE class room installation provides selected and allotted facilities within each class room, consisting of clothing accommodations for pupils, supply storage space, teacher's personal accommodations and adequate space for necessary books.

Five Bergerobes will accommodate 40 pupils and a Bergerobe supply closet, teacher's closet and bookcase completes the requirements of each room.

Each Bergerobe consists of a metal unit 26″ wide equipped with two receding type doors. The floor, walls and ceiling are of steel. Door operating hardware is ball bearing, non-projecting, mounted to the side frames of the unit, thus eliminating all hardware from the floor. No hardware on the floor precludes tripping of pupils and the floors may be swept clean without inconvenience. The recognized standard method of ventilation is maintained with Bergerobes.

Shelves are adjustable, thus providing for shelf height changes at any and all times. Double prong type hooks with numbers are provided.

The projection of the doors as they are operated is only 1″ into the aisles. Thus, the greatest freedom of aisle space is obtainable with a Bergerobe installation.

Bergerobes are multiple operated, multiple locked when open and multiple locked when closed. Write for catalog and complete information.

Doors Open

BERGEROBES — The Modern, Economical School Wardrobe

THE BERGER MANUFACTURING CO.

DIVISION OF REPUBLIC STEEL CORPORATION

Canton, Ohio

Two-Person Lockers

BERLOY STEEL EQUIPMENT is manufactured by an organization that **knows** the needs of the modern school and university. Built to meet the most rigid requirements for durability, utility, and structural perfection Berloy Steel Lockers, Cabinets, and Shelving nevertheless can be purchased at prices quoted for the commonplace.

Berloy Steel Equipment possesses unusual beauty of design and finish. All items are quickly available in practically every size and type. Experienced Berloy Engineers will be sent anywhere to assist architects, builders, or purchasing agents in the planning of new installations.

Berger's 50-year reputation for highest quality goods, square dealing, and fair prices insures complete satisfaction.

Filing Cabinets

Teachers' Combination Cabinet

BERLOY

"FIRST IN LOCKER VALUES"

Book Shelving

Students' Corridor Single Tier Lockers

Teachers' Combination Wardrobe Lockers

Students' Gymnasium Compartment Lockers

Students' Gymnasium Double Tier Lockers

THE GLOBE-WERNICKE CO.

Ross and Carthage Aves.
Cincinnati, Ohio

The Tri-Guard principle is a revolutionary improvement in filing—exclusive with Globe-Wernicke

ENJOY THE ADVANTAGES OF EFFICIENT AND ATTRACTIVE OFFICE AND LIBRARY EQUIPMENT

Modern Globe-Wernicke equipment and systems for schools, libraries and offices enable people to accomplish more work with less effort, keep office routine operating smoothly, increase efficiency and economy. For more than fifty years the products of this company have been famous for their dependable quality and fine craftsmanship.

Filing Cabinets

There is a G/W file for every business need and price range. Our better grades in steel and wood have many distinctive advantages, including the Tri-Guard principle—the outstanding filing development in years. Each guide slides on three rods, which act as a "sway-check" . . . they support, as well as index contents of the drawer . . . ample working space is available without frequent readjustment of follower. Tri-Guard files speed up filing and finding with less work and greater economy.

Sectional Bookcases, Steel and Wood

This company originated the unit idea in bookcases and has been the leader in their development. G/W sectional bookcases are available in several distinctive designs and standard finishes for school, home and office. They are carefully designed, well made and finished to combine attractive appearance, convenience, efficiency, and economy.

G/W sectional bookcases permit expansion to meet individual needs

Steel Shelving

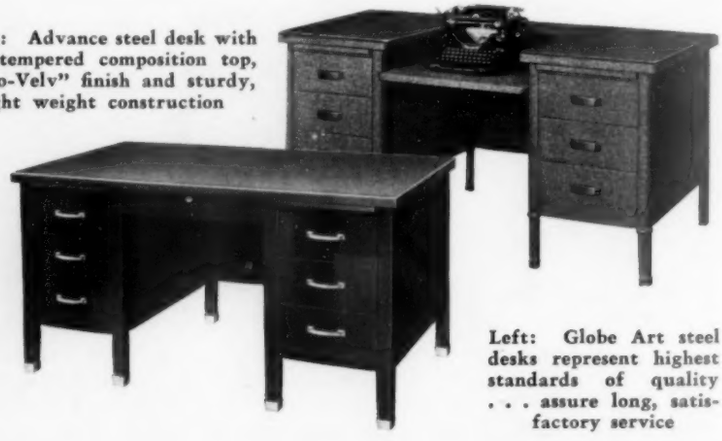
G/W steel shelving gives economical service for a business lifetime. It is easy to install and can be adapted to individual needs and floor space available. Additional units may be obtained for expansion and shelving can be taken down and reset with 100% salvage.

Steel Desks and Tables

Many exclusive features of construction and design make G/W steel desks and tables very desirable for office and school use. They are attractive, sturdy and give satisfactory service for a long time.

There are many places where G/W steel storage shelving can be used to advantage

Right: Advance steel desk with hard-tempered composition top, "Duro-Velv" finish and sturdy, light weight construction



Left: Globe Art steel desks represent highest standards of quality . . . assure long, satisfactory service

Visible Record Equipment and Supplies

Visible records provide important facts instantly. They can be used by every business or institution where it is necessary to keep records. Both cabinets and books are available in various styles and sizes.

Signals call attention to matters that need prompt attention. This control system saves time, work and money. Stock or special forms are provided for any type of record.

The Globe-Wernicke visible record system can be applied to every division of a business

Book Shelves

Slotted type book shelf units offer an economical, space-saving method of housing books. Removable end panels permit expansion. Extra units may be added as desired. Regularly furnished with six shelves adjustable every half inch.

Storage and Wardrobe Cabinets

G/W steel storage and wardrobe cabinets are made in two grades and several sizes. Contents are kept clean and quickly accessible. Loss is prevented—privacy assured. They are fire resistant and practically dust-proof.

Horizontal Sections

Standard stock equipment is available for filing all types of records—top, bottom, sides, and back are closed, increasing strength, fire resistance, and protection from dust.

Steel slotted type book shelving is used for storing books in many schools, libraries and offices

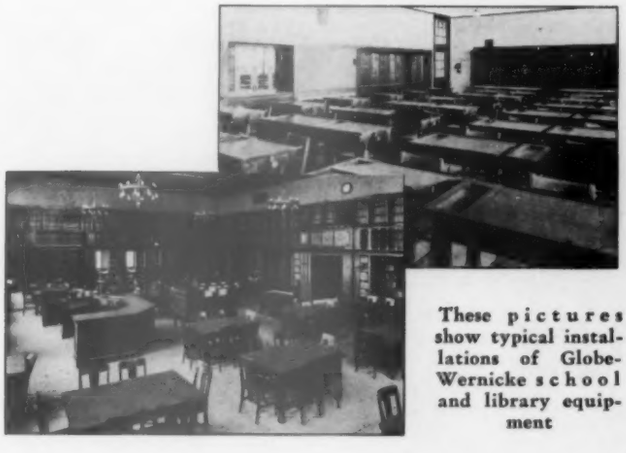
School and Library Equipment

If you are planning additions to your school or library equipment, let Globe-Wernicke engineers and experts help solve your problems. You can benefit by our long experience in this field. We are glad to co-operate with architects, builders and committees.

Write to us for more information about any Globe-Wernicke products and name of nearest dealer

G/W storage and wardrobe cabinets meet every storage need

Standard stock equipment for filing all types of records



These pictures show typical installations of Globe-Wernicke school and library equipment

THE GENERAL FIREPROOFING COMPANY

Youngstown, Ohio

BRANCHES
BOSTON—74 Franklin Street
CHICAGO—36 S. State Street
CLEVELAND—1235-37 Prospect Street
HARTFORD—8 Ford Street
LOS ANGELES—1733-35 So. Los Angeles Street
MINNEAPOLIS—310 N. First Street

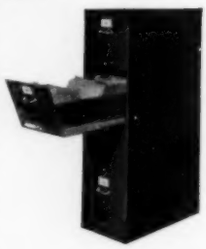
BRANCHES
NEWARK—17 Academy Street
NEW YORK—500 Fifth Avenue
PHILADELPHIA—2301 Chestnut Street
PITTSBURGH—642 Grant Street
ST. LOUIS—521-523 Arcade Building
SAN FRANCISCO—534 Fourth Street

WASHINGTON—201 Mills Building

Dealers Elsewhere. Write for Name of One Nearest You

Metal Office, Classroom and Cafeteria Equipment

RECORD FILING EQUIPMENT



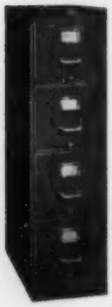
Three, four and five-drawer Super-Filers for all types of records. The drawers of these cabinets have swing fronts that open as the drawer is opened and close as the drawer is closed, thus providing working space without any reduction of the filing capacity. Greater freedom of filing is secured, many of the ordinary operations of filing are mechanized. 18% more capacity, 25% faster filing. Three-drawer letter and cap files are of counter-height, four-drawer are standard height. The five-drawer cabinets give 48% greater capacity on the same floor space. Supplied with and without lock. No. 5404-L letter size unit as shown takes records up to 12¼" x 11$\frac{5}{32}$". No. 5404-C cap-size unit takes records up to 15½" x 11$\frac{5}{32}$".

COMBINATION CARD RECORD AND LETTER OR CAP-SIZE FILE

This file has two card index drawers at the top for 5 x 3 or 6 x 4 cards and three letter-size drawers for miscellaneous filing. Ideal for student records as the card record provides a means for cross reference. Also supplied with cap-size drawers.

CARD INDEX CABINETS FOR 5 x 3, 6 x 4 OR 8 x 5 CARDS

A wide variety of card index cabinets from single drawer units for use on top of a desk to twelve-drawer units as illustrated. Ten, eleven and twelve-drawer units for 5 x 3 cards; eight and nine-drawer units for 6 x 4 cards; seven and eight-drawer units for 8 x 5 cards, all in standard 52-inch height cabinets. Cabinets of counter-height also available.



LOWER-PRICED FILES FOR MISCELLANEOUS FILING

Four-drawer, rigid-front filing cabinets. These cabinets are of the conventional type, having rigid drawer fronts and compressors. Supplied in letter and cap-size, also in bill-size with five-drawers. Cabinets of similar grade also available in counter-height units.

SECTIONAL METAL BOOK CASES

Sectional Steel Book Cases. Strong, rigid inter-locking sections of various depths to accommodate books of varying heights. Sections are fitted with clear glass doors that operate on an equalizing mechanism that positively prevents wedging of doors when moved back into the cabinet. Non-warping construction. Bases and tops to match sections. Finished in oven-baked enamel—olive green or grained effects.

ADJUSTABLE BOOK SHELVING

Adjust-a-Shelf Book Units employ the same type of slotted shelf adjustment as standard library shelving of the larger installations. Units are supplied in 84-inch and 90-inch heights, each unit having a base shelf and six adjustable shelves. Adjustment slots are at one-inch intervals. Any number of units may be assembled together to form complete installations.

LIBRARY SHELVING

A special type of shelving for large libraries. Two types—free-standing and multiple-tier. Illustration shows part of an installation for the University of Minnesota. Engineering and consulting service for architects and building committees.

FIRE-RESISTIVE SAFES FOR VITAL RECORDS

Fire-resistive safes for student's records and college accounts. Highest rating of Underwriters' Laboratories for fire protection. Hundreds of cases of severe exposure and perfect performance of these safes attest their dependability. Interiors assembled from stock filing units to meet requirements.

WRITE FOR LARGE COMPLETE CATALOG OF METAL EQUIPMENT

THE AMERICAN SCHOOL AND UNIVERSITY

METAL DESKS AND TABLES

Desks of 66″, 60″, 50″ and 45″ widths for office or instructor's use. Pleasing design, practical utility, durable construction and finish. Last for years minus repairs and refinishing.

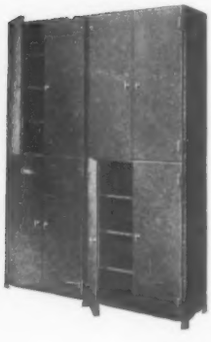
Typewriter desks of 60″, 50″ and 45″ widths for business schools, commercial departments, school offices and boards of education. Full complement of drawers for records, supplies and filing.

Metal Tables for class rooms or offices, matching desks in construction and finish. 72″, 66,″, 60″, 50″, 45″ and 36″ widths.

SECRETARIES

Secretaries for teachers' records and dormitory rooms. Serves as telephone stand, writing desk, study table. Drawers for manuscript, examination papers, stationery and card records. Space for portable typewriter and pull-out shelf for writing or typing.

STEEL SHELVING FOR SUPPLY STORAGE



Steel Shelving for general supply rooms. Quickly erected or altered to meet any and all conditions of space or stored materials. Skeleton type, semi-enclosed or fully enclosed with doors. Provides systematic and controlled storage of expensive supplies.

STEEL SUPPLY STORAGE CABINETS

Steel Storage Cabinets for classroom or departmental supplies. Adjustable shelves, dust-excluding doors with locks. Combination units for supplies and wardrobe purposes.

Double-door Storage Cabinet with four adjustable shelves. Outside dimensions, 36″ wide, 78″ high and 19½″ or 25½″ deep.

Single-door Storage Cabinet with four adjustable shelves. Outside dimensions, 24″ wide, 78″ high and 19½″ or 25½″ deep.

STEEL WARDROBES

Single and Double-door Wardrobes for teachers. Also may be assembled in batteries for pupils' wraps. Louvred backs for ventilation, hat shelf and coat rod in each cabinet. Doors fitted with automobile type lock handles. Outside dimensions of single door cabinet—24″ wide, 78″ high, and in 19½″ or 25½″ depths. Double door cabinets—36″ wide, 78″ high and 19½″ or 25½″ deep.

ALUMINUM CHAIRS FOR OFFICES, CLASSROOM, CAFETERIAS

Aluminum Swivel Chair for teacher's use. Light in weight and easily moved to and from desk. Genuine leather upholstery. Latest type swivel iron and ball-bearing casters.

Side chair companion to chair shown above. Strong, durable, light-weight aluminum construction.

Swivel chair for superintendent's office. An exceptionally comfortable and well proportioned chair. Made of aluminum. Upholstered in genuine leather. Light in weight. Ball-bearing casters and latest type swivel iron.

Tablet-arm Aluminum chair for classrooms. Strongly built, welded construction. Very portable and easily moved to facilitate sweeping operations.

Also special chairs and tables for cafeterias.

WRITE FOR LARGE COMPLETE CATALOG OF METAL EQUIPMENT

THE AMERICAN SCHOOL AND UNIVERSITY

ALL-STEEL-EQUIP COMPANY, INC.

551 Griffith Ave.
New York, N. Y., 56-58 W. 22nd St.
BRANCHES AND SALES OFFICES
IN PRINCIPAL CITIES

Aurora, Illinois
Chicago, Ill., 326 S. Jefferson St.
Detroit, Mich., 311 Donovan Bldg.

WRITE FOR LATEST CATALOG OF SCHOOL EQUIPMENT

MODERN STEEL LOCKERS

Smoothness, strength, simplicity of design characterize the All-Steel-Equip locker for 1937. Utility and beauty are cleverly combined; the distinctive one-piece handle—finished in satin Chrome—is tamper proof, will not become loosened, and incorporates an unobtrusive padlock strike that keeps padlock from touching the door front and marring its finish. Hinges are cunningly constructed to be smooth in appearance, jimmy-proof, non-sagging in operation. Louvres, which afford a maximum of ventilation, are strikingly designed in the modern manner.

In every detail of construction A-S-E lockers are ruggedly built to provide years of service in the school plant.

Finished in Olive Green baked on enamel, French Grey, School Furniture Brown. Other colors to order.

Send for Catalog No. C-30 for more information about the broad variety of types and styles available.

TEACHER CONTROL WALL-ROBES

For the first time All-Steel-Equip Company announces a new clothing storage system for elementary schools, a battery of steel Wall-Robes with one point lock control but with individual door operation. Each single unit in the battery can be made to accommodate as many as six pupils; a wide variety of shelf, partition, and hook arrangements in pupils' unit is available at standard unit price. Teacher's unit may be wardrobe, book shelf unit, or combination. Wall-Robes may be recessed in walls of new buildings or set up, free standing, in remodeled buildings. Tremendous saving in space can be effected by their use.

Handles, hinges and louvres are the same design as those on A-S-E locker and finishes are the same. Write for Bulletin No. WR-1.

STEEL CABINETS

A line of fifty-seven models of strong steel cabinets with single or double doors, adjustable shelves, grooved key disc tumbler lock, smart vault type hardware, offers a unit for any particular school need. Standard finish is Olive Green, but Walnut, Mahogany, grained Oak or French Grey may be furnished upon specification. Ask for Catalog No. 175.

PATRICIAN SHELVING

Steel shelving that combines the beauty of wood with the strength and durability of steel. 36" wide sections may be used as single units or in batteries. Easily erected, easily moved.

PRODUCTS AND COMPANY

In 1937 A-S-E celebrates twenty-five years of manufacturing steel lockers, steel book shelving, steel storage, filing and wardrobe cabinets; steel transfer cases, card cabinets, drill cabinets, filing cabinets, typewriter stands, steel shop equipment.

ENGINEERING SERVICE

ASE offers an experienced and intelligent consulting and design service to help provide maximum of efficiency in the utilization of available space. Branch offices provide prompt and accurate supervision.

BROWNE-MORSE COMPANY

FACTORY AND GENERAL OFFICES

Muskegon, Michigan

A steel filing cabinet for every filing need. Four grades, in all the standard sizes, heights, and finishes.

For the school office or class room, Browne-Morse has a steel desk made purposely for it. Two lines, complete in all the various sizes, styles, and finishes, to select from.

Browne-Morse Steel Equipment as designed is particularly adaptable to the needs of the modern school, college, and university.

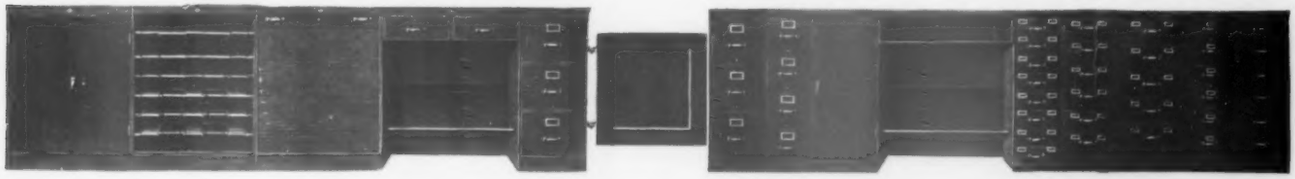
Every requirement for utility, service and appearance is successfully met. Browne-Morse Steel Equipment possesses unusual beauty of design and finish, and is rigidly and strongly built to last a lifetime.

Our 29 years' experience in equipping schools, colleges and universities attests the complete adaptability of our Steel Equipment for school work.

We also welcome the construction of steel equipment made to order. Our engineering department is headed by men experienced in this field. Their experience is at your command.

Single and double door Cupboards, Wardrobes, and combination Cupboard and Wardrobes, in all finishes.

A most flexible type of steel book shelving with adjustable shelves. Four heights, four widths, and two depths, make it a most flexible line with which to meet practically any room layout or condition.



Double Purpose Steel Counter High Equipment

In many offices a counter is necessary. By using counter high units, the usual vacant space under the counter is used for filing purposes. Records are instantly accessible and are so conveniently located that many steps and much time is saved.

The arrangement of counters with Browne-Morse equipment is almost unlimited.

LYON METAL PRODUCTS, INCORPORATED

1335 Madison Ave., Aurora, Illinois

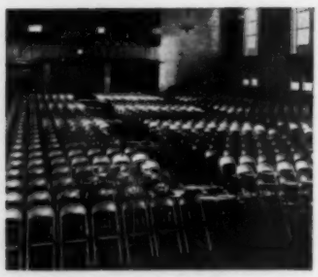
SALES OFFICES IN ALL PRINCIPAL CITIES

CONSULT YOUR CLASSIFIED TELEPHONE DIRECTORY

Single Tier Lockers

Cabinet

Shop Bench



Lyon Chairs in Auditorium

Schools, universities and institutions have been using Lyon Steel Products for thirty-five years. Lyon Engineers will be very glad to cooperate in your selection of equipment. Experienced erection superintendents are conveniently located to give prompt and efficient erection service.

8,000,000 steel lockers in use conclusively proves that Lyon Steel Products leads in design, workmanship, efficiency and appearance.

STEEL LOCKERS

For every school use. Available in a wide variety of styles including single tier, double tier, box lockers, gym type lockers, two-person lockers and double door lockers. Ask for Catalog No. 233.

STEEL CABINETS

Built in a complete range of styles and sizes to meet every requirement for classrooms, study, office and supply departments. Ask for Catalog No. 482.

SHOP BENCHES

A sturdy, well designed shop bench with heavy steel top will withstand hard use and abuse. Available in a variety of lengths — with bench drawer or without. See Catalog No. 323.

STEEL FOLDING CHAIRS

Comfortable, durable, safe, quiet and attractive portable seating. Several types—fully upholstered, semi-upholstered, non-upholstered, with arms, without arms, and with steel cane saddle seat. Variety of finishes to harmonize with any interior. Send for Catalog No. 835.

LYON CLOAKROBE

Developed primarily for the elementary school classroom to eliminate the many disadvantages of cloakrooms and bulky, inconvenient wardrobes. Built of steel, the doors will not warp, shrink, bend, bind or sag—it will give continued satisfactory service for many years.

Lyon Cloakrobe offers ample space for individual clothes storage; free and unobstructed air circulation; and its attractive exterior design will enhance the appearance of any classroom.

Opening or closing the master door, controls the simultaneous operation of both doors in each unit of the section. The control mechanism is simple, strong, yet positive in action and easy to operate.

Complete details sent on request.

STORAGE SHELVING

For the efficient storage of school supplies and equipment. Built to carry heavy loads, yet it is easily adjusted and can be quickly taken down and set up in a new location. All parts are interchangeable and additional parts may be added when required. Finished in Lyon green enamel, baked on to withstand hard use and abuse. Ask for Catalog No. 118.

TOOL CRIBS

Special inserts containing sloping shelves or small compartments may be secured for the storage of tools, permitting each item to be visible at all times.

Sturdily constructed, well designed and built to withstand years of hard service. All parts adjustable and interchangeable. Catalog No. 105.

DURABILT
STEEL LOCKERS AND CABINETS

DURABILT

REG. TRADE MARK

DURABILT STEEL LOCKER CO. AURORA, ILLINOIS

THE ANSWER TO YOUR CLOTHING AND EQUIPMENT STORAGE PROBLEM IS

DURABILT

Durabilt Steel Lockers and Durabilt Steel Cabinets, described and illustrated on the following pages, are the result of hundreds of tests and experiments based on the careful study of large installations in daily use, in schools, clubs, offices, industrials, etc., as well as the experience gained through years of specialization in the building of locker and cabinet equipment. Before you buy—before you specify—compare the Durabilt line with others—study the details of construction—check the specifications—see for yourself that here in this equipment, embodying so perfect a combination of neatness, sturdiness and many unique features, is the logical solution to your clothing and equipment problem.

DURABILT STEEL LOCKERS

meet every architectural and service requirement . . .

Durabilt Steel Lockers are renowned, in addition to their economy, for their features of distinctive design and attractive finishes; for their wide range of adaptability; for their sturdiness and modern refinements of construction.

Your requirements may be for school, club, factory, store, office, bank or lodge hall—they may be for thousands of lockers for new buildings or for a few hundred to provide increased facilities in present ones. No matter what the condition or the need, Durabilt is your assurance of meeting, in every respect, every architectural and service requirement.

DURABILT STEEL CABINETS

provide unlimited adjustability to interior arrangement . . .

Durabilt Steel Cabinets fill a long-felt need. Space savers—money savers, too—they are unlimited in application. Their range of uses is so wide, due to the numerous sizes available and the innumerable combinations of adjustable interior equipment, that they readily meet all storage requirements of business, social, educational, or institutional establishments.

DURABILT ADVISORY SERVICE

is always available for guidance in the solution of special problems .

While Durabilt Lockers and Cabinets have been standardized to meet the majority of needs, we are prepared not only to submit sketches on special designs but also to assist in an advisory capacity the preparation of any locker plans and specifications that may involve unusual considerations and conditions. A request to any of our sales offices or to us direct, will bring a Durabilt Sales Engineer to your assistance.

DURABILT

"No Better Built Than Durabilt"

DURABILT STEEL LOCKER CO.

527 Arnold Avenue
AURORA, ILLINOIS

•

SALES OFFICES
IN
ALL PRINCIPAL CITIES

•

THIS SINGLE TIER DURABILT STEEL LOCKER

is but one of the innumerable types available in the Durabilt Locker Line

●

THERE IS A DURABILT LOCKER TO MEET EVERY REQUIREMENT

Above are shown two Durabilt full length or Single Tier Steel Lockers, free standing on legs, one closed and one open; the latter showing standard equipment: hat shelf, double prong ceiling hook and single prong side hooks.

for instance . . .

High School
Single Tier Lockers Recessed in Corridor Walls

Country Club
Single Tier Lockers Set on Cement Bases, Double Row (Back to Back)

Type Foundry
Single Tier Lockers, Free Standing, Double Row (Back to Back)

National Bank
Single Tier Lockers, Free Standing, Set Against Wall

● for Schools and Gymnasiums

For clothing storage, the Durabilt Lockers best suited to schools and gymnasiums are the specially equipped full length or Single Tier lockers either recessed in the walls, on concrete bases, or free standing on legs. Where Single Tier lockers are not desired, we recommend the use of Double Tier Lockers. Multiple Tier Lockers, or "Box" Lockers are ideally adapted to storage of gym suits, books, sewing materials, etc. Combinations of any of these types, are of course, available. Durabilt Basket Racks and Trucks for gymnasiums, pools, etc., furnish well ventilated and secure storage facilities. All such equipment is treated in detail on the following pages.

● for Clubs, Lodges, Hotels, etc.

As in the case of schools, the specially fitted or equipped interiors of full length or Single Tier lockers either recessed in the walls, mounted on concrete bases, or free standing on legs are best suited to clubs, lodges, hotels, etc. Double Tier and Multiple Tier (Box) Lockers are also widely used in these instances.

● for Factories, Plants, Mills, etc.

For industrial establishments having large numbers of employees and where floor space is limited, there is available, in place of the full length lockers, a combination of Box Lockers and Single Tier lockers, commonly known as Compartment Lockers. The Multiple Tier (Box) Lockers are especially useful in storing small tools, aprons, shoes, gloves and such work-day articles.

● for Offices, Stores, Banks, etc.

For the employees of such commercial establishments, the adaptation of Durabilt Steel Lockers is, of course, dependent upon the number of employees, floor space, interior decoration, etc. Any of the above mentioned lockers either singly or in the innumerable combinations possible, are certain to meet ordinary or special requirements.

20 CONSTRUCTION

Top Construction—Showing how locker is reinforced at every point that is subject to strain. Each top, bottom, back and shelf is so flanged, that where lockers are joined together these flanges and the intermediate side provide three thicknesses of metal for reinforcement.
Corner Construction of Door Frame
Two Hole Single and Double Prong Udylite Finished Coat Hooks
"Safety" Louvres
Specially Designed Lock with German Silver Keys
Adjustable Rear Leg
The Improved Durabilt Locker
Flush Bottom (Strong and Easy to Clean)
Adjustable Front Feet

"NO BETTER BUILT THAN DURABILT"

1—**Rigid Door Frame**—1 x 1 x ⅛-in. hard steel angle uprights. 1½ x ¾ in. No. 14 gauge formed steel channel cross members securely joined to uprights at each end by two 3/16-in. counter-sunk head rivets, as riveting for this purpose is much stronger than welding. (Since the strength of any locker is dependent on the rigidity of the door frame, it will pay you to look into this point carefully when selecting locker equipment.)

*2—**Semi-flexible Doors**—Durabilt Standard Doors are made of cold rolled, stretcher leveled 16 gauge special enameling steel with square tubular reinforcement housing the latching device, with a channel formation at the vertical edge on the hinge side, and with a flange on top and bottom.

*3—**Silent Unlocking Device with Pre-locking Features**—Durabilt single and double tier lockers are equipped with an unlocking device so that doors in closed position are always locked unless manually unlocked. This device is so constructed that raising of handle silently disengages lock fingers allowing locker door to open. This device will operate with all standard locks, permits of pre-locking, and prevents accidental locking of door in open position.

4—**Patented Stamped Steel (not cast) Straight-Lift Handle**—With curled grip providing ample space for comfortable hand-hold and attached directly to unlocking bar. Cadmium finish (chromium optional).

*5—**Padlocking Attachment with Rubber Silencers**—Arranged for use of any standard padlock; and in addition, is designed with rubber silencers so that noise is practically eliminated when handle is operated.

*6—**Full looped (metal formed completely around pin), five-knuckle Strap Hinge**—Attached to door with two Binder Head bolts (open door will not strike adjoining locker). Three on single tier and two on double tier standard lockers. The hinges are riveted to the door frame directly opposite the lock fingers as this gives added security. Hinge pins are embedded in angle so they cannot be driven out, neither would the removing of hinge bolts make it possible to enter the locked locker without a key.

*7—**"Streamline" Ventilating Louvres**—These modern, safety-type louvres are designed to provide ample ventilation and to prevent personal injury on them. Louvres are 4½ inches wide, with 3/16 inch opening and are 1⅛ inches apart, center to center.

*8—**Improved Lock Fingers with Rubber Silencers**—Extra heavy, reinforced fin-

THESE ARE NEW AND

FEATURES OF MERIT

gers made to engage directly with door and so designed that door in closed position is always locked. These fingers are pick and tamper proof, and will release only by operating unlocking device. All fingers have corrugated rubber bumpers securely inserted for silent operation.

9—**All Coat Hooks attached with two Screws**—making it impossible to twist off by hand or remove without use of tools. Udylite (cadmium) rust-proof finish.

*10—**Perfect Fitting Top and End Finishing Strips**—attached by means of concealed screws. (By far the neatest and most attractive trim ever furnished for recessed locker installations.)

*11—**Modernistic Number Plates**—Each locker furnished with attractive satin nickel finish brass number plate with black filled depressed number 7/16 in. high. Plates securely attached with split rivets (not screws) making stealing of them very difficult.

12—**Flush Bottom**—(Easily cleaned and built strong enough so that standing on Bottom will not injure it.)

13—**Adjustable Rear Legs**—(Very desirable for leveling up rear of lockers when floors are uneven.)

14—**Adjustable Front Feet**—(Permit anchoring and taking up of irregularities due to floor unevenness.)

15—**All Screws and Nuts rust-proofed by the Udylite Process**—(This precaution eliminates possibility of getting rust spots on clothing.) All outside screws are of the slotless binder head type.

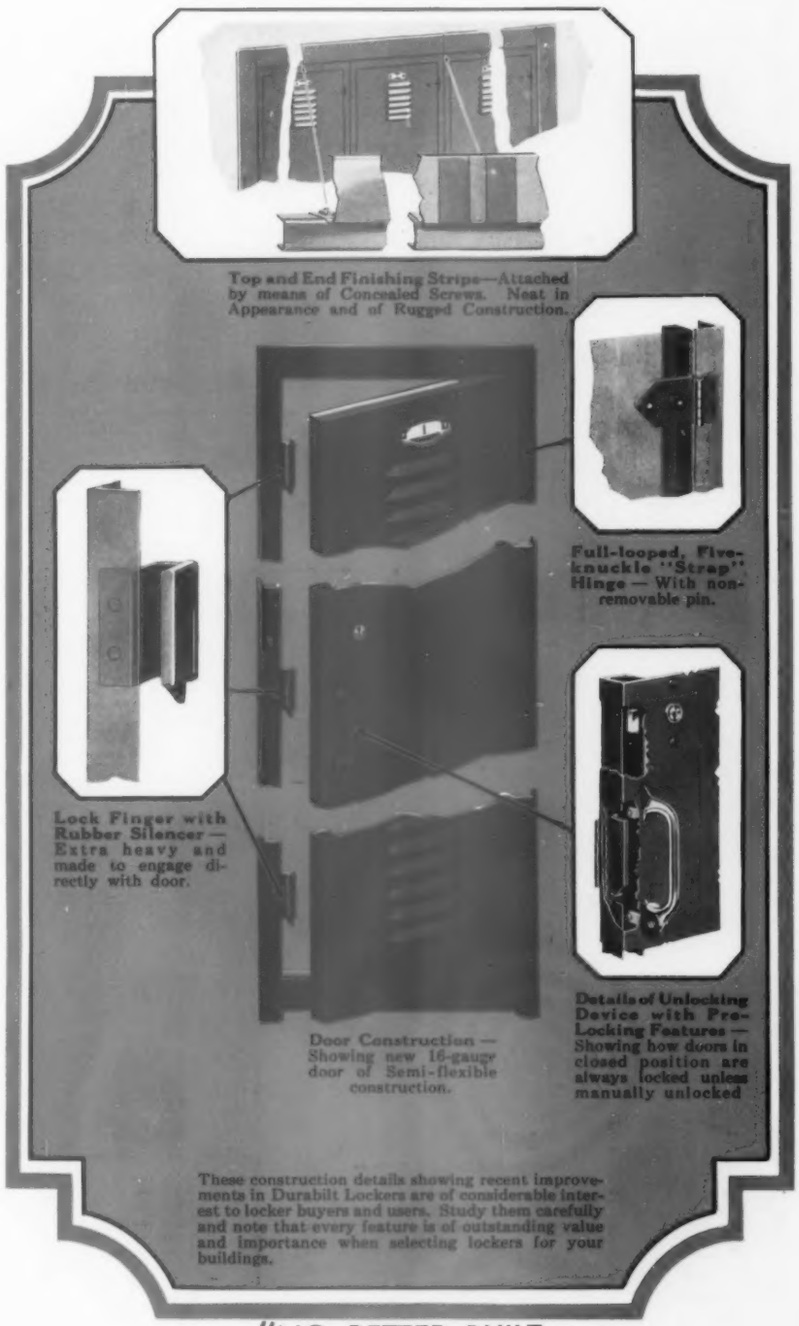
16—**Binder Head Hinge Bolts with Knurl under Head, Two to each Hinge**—(Hold door securely and do not work loose in every-day use.) Heads of bolts are Parkerized to rust-proof and then enameled same color as door.

17—**Curled Front Edge on Shelf**—(No danger of injury by children hanging on them.)

18—**Right Hand Swinging Doors**—Doors are hinged to swing to the Right (not left) as this is the logical way for right-handed people to open them.

*19—**Attractive "Satin Texture" Mar Proof Enamel Finish**—Baked on at proper temperature to insure finest appearance and durability. (Will stand rigid hammer test without flaking, and finger test without scratching.) All parts thoroughly cleaned before enamel is applied.

20—**Special Equipment**—In addition to standard equipment such special equipment as vertical partitions, coat rods, closed bases, drawers, umbrella racks, drip pans, mirrors, comb and brush trays, towel rods, golf ball trays, golf bag chains, chapeau hooks, sword clips, gun clips, etc., can be furnished to order.


Top and End Finishing Strips—Attached by means of Concealed Screws. Neat in Appearance and of Rugged Construction.
Full-looped, Five-knuckle "Strap" Hinge — With non-removable pin.
Lock Finger with Rubber Silencer — Extra heavy and made to engage directly with door.
Door Construction — Showing new 16-gauge door of Semi-flexible construction.
Details of Unlocking Device with Pre-Locking Features — Showing how doors in closed position are always locked unless manually unlocked
These construction details showing recent improvements in Durabilt Lockers are of considerable interest to locker buyers and users. Study them carefully and note that every feature is of outstanding value and importance when selecting lockers for your buildings.

"NO BETTER BUILT THAN DURABILT"

EXCLUSIVE FEATURES

THE AMERICAN SCHOOL AND UNIVERSITY

DURABILT STEEL CABINETS

SAFE AND ORDERLY STORAGE

Storage Cabinet
(Double Door)

Single Door
W. D. H.
19½" x 21" x 66"
19½" x 21" x 78"

Double Door
W. D. H.
36" x 21" x 66"
36" x 15" x 78"
36" x 18" x 78"
36" x 21" x 78"
36" x 24" x 78"

Counter High Cabinet
W. D. H.
36" x 18" x 42"
36" x 21" x 42"
36" x 24" x 42"

Doorless Cabinets
W. D. H.
36" x 9" x 78"
36" x 12" x 78"

For secure, dust-proof, fire retarding, vermin-proof and orderly storage of books, catalogs, stationery and office supplies; for wardrobe purposes and thousands of other uses Durabilt Steel Cabinets are an economic necessity. Choice of brown or green wrinkle finish.

Cabinet with Sliding Shelf

A Durabilt storage cabinet equipped with a sliding shelf is a most useful item in any school, office, factory or store. Do your checking on the shelf—no need to carry heavy books or files to a desk or table. Sliding shelves to fit 36" wide cabinets 18" deep are carried in stock.

Desk High Cabinet
W. D. H.
19½" x 21" x 30½"

COMBINATION CABINETS
W. D. H.
36" x 18" x 78"
36" x 21" x 78"
36" x 24" x 78"

Wardrobe Cabinet
(Single Door)

Single Door
W. D. H.
19½" x 21" x 66"
19½" x 21" x 78"

Double Door
W. D. H.
36" x 21" x 66"
36" x 18" x 78"
36" x 21" x 78"
36" x 24" x 78"

Complete with Hat Shelf, Coat Rod and Hook Assembly

Stationery Cabinet
(Double Door)

Doorless Cabinet
(For Books)

Combination Cabinet
(Full Height Partition)

Combination Cabinet
(Short Partition)

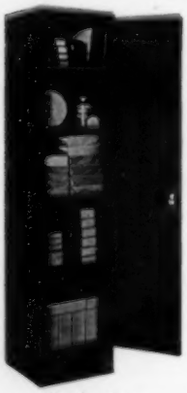
Electrotype Cabinet
(With 2" Drawers)

Wardrobe Cabinet
(Double Door)

Steel Cupboards and Wardrobes

Low Cost Storage

Durabilt Cupboards and Wardrobes (locker design) are substantially built of steel. They provide all the storage space of higher priced cabinets but cost much less due to their simplified design and construction. You will find these cupboards very useful in stockrooms and out of the way places where more elaborate cabinets are not required.



Single Door
Cupboard
W. D. H.
18" x 18" x 66"

SINGLE DOOR CUPBOARDS

These units provide storage for a surprisingly large amount of office supplies. Usually equipped with four adjustable shelves. More can be added.

Door is hinged at three places on right side and is operated by neatly designed stream-lined, stamped steel handle. Secure lock with two keys always furnished. Cupboards can also be locked with padlock, if desired.

Cupboard is built to stand much use and abuse and the cost is surprisingly low.

Combination Storage and
Wardrobe Cupboard

Interior equipment for combination storage and wardrobe cupboards consists of full width storage and wardrobe shelf 12" from top, coat rod and 4 hooks in 24" wide cabinet, wardrobe is 10" and cupboard is 14" wide. In 36" wide cabinet, wardrobe is 16" wide and cupboard is 20" wide. Cupboards in both sizes have 4 storage shelves. More can be added.

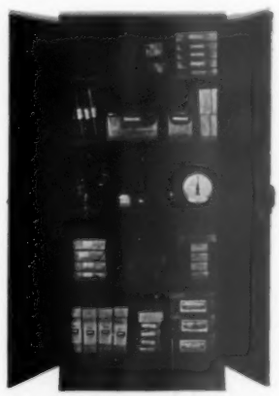
W. D. H.
24" x 18" x 66"
36" x 18" x 66"
36" x 18" x 78"

Double Door Cupboards and Wardrobes

Shelves are instantly adjustable on 1" centers without tools. Wardrobe shelf assembly consists of large shelf for hats and parcels, a coat rod and six double prong ceiling hooks. Choice of either Olive Green or "School Furniture" Brown, on all sizes of these Cupboards.

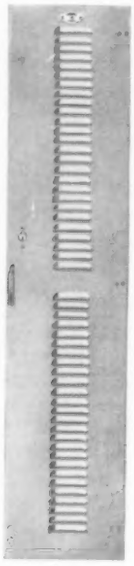
Storage
W. D. H.
24" x 18" x 66"
36" x 18" x 66"
36" x 18" x 78"

Wardrobe
W. D. H.
24" x 18" x 66"
36" x 18" x 66"
36" x 18" x 78"



Double Door Storage
Cupboard

Standard Louvre



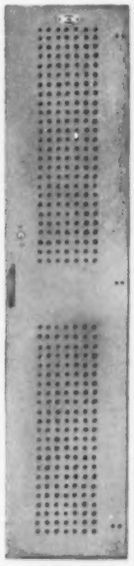
Full Louvre

TYPES OF LOCKER DOOR PERFORATION

STANDARD LOUVRE			STANDARD ROUND HOLE		
Size of locker	No. of Louvres Top of door	Bottom of door	Size of locker	No. of round holes Top of door	Bottom of door
72″ S.T.	6	6	72″ S.T.	49	49
60″ S.T.	6	6	60″ S.T.	49	49
42″ D.T.	3	3	42″ D.T.	28	28
36″ D.T.	3	3	36″ D.T.	28	28
FULL LOUVRE			FULL ROUND HOLE		
72″ S.T.	22	30	72″ S.T.	147	196
60″ S.T.	16	24	60″ S.T.	98	147
	No. of louvres			No. of round holes	
42″ D.T.	Upper door 23 | 3		42″ D.T.	Upper door 168 | 28	
	Lower door 3 | 23			Lower door 28 | 168	
36″ D.T.	Upper door 18 | 3		36″ D.T.	Upper door 140 | 28	
	Lower door 3 | 18			Lower door 28 | 140	

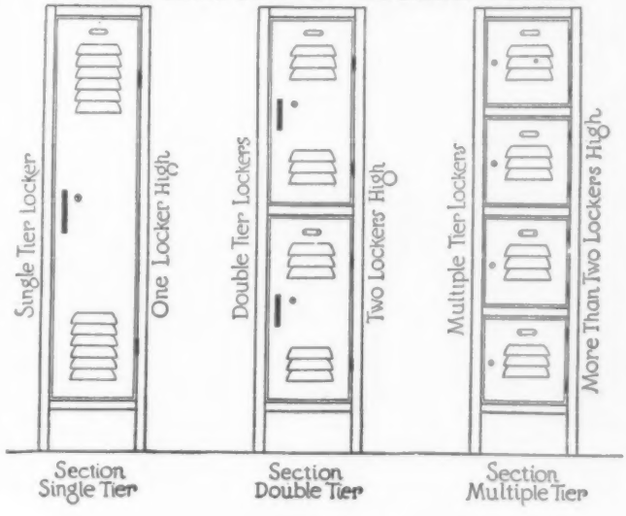
Louvres are 4½″ wide x 3/16″ deep—1⅛″ apart, center to center. Round holes are ½″ in diameter on 1″ centers.

Standard Round Hole



Full Round Hole

NOMENCLATURE OF LOCKER TERMS



A Locker:
The term "locker" is used to describe *each opening having its own door*, regardless of arrangement.

A Section:
The term "section" is used to describe an arrangement *one locker wide*. A section may be made: Single Tier, Double Tier, Multiple Tier (Box Lockers) as shown in Figures 1, 2 and 3 respectively.

A Group:
The term "group" is used to describe *an assembly of sections*. A group may be composed of single tier, double tier, or multiple tier (box) lockers, and may be arranged single row (that is, with one face) or double row back to back (with two faces).

An Installation:
This term is used to describe *the arrangement of "groups" as installed*. In planning installations particular attention should be given to width of aisles. Aisle space between opposite ends of locker rows should not be less than 24 ins. Aisle space between locker rows should be twice the locker width, plus 12 ins. as a minimum. For example, if lockers are 12 ins. wide, aisle space between locker rows would be 36 ins. Space between face of lockers and mid-aisle benches should be the width of the locker, plus 6 ins. For example if lockers are 12 ins. wide, this space should be 18 ins. These dimensions are given as a minimum. If space permits, the aisles in the locker rooms between the lockers should be wider.

EQUIPMENT

Shelves:
All Single Tier lockers, unless special, are equipped with one shelf as standard. (Double Tier and Multiple Tier lockers are not shelf-equipped as standard.) If additional shelves are required, they may be secured by specifying the number required and position desired.

Legs:
All lockers are equipped with legs as standard. Legs may be omitted if desired, but must be so specified when ordering.

Closed Bases:
The term "closed base" describes the part used to close the space between the bottom of the locker and the floor. When closed bases are required, be sure to specify if fronts only are to be closed, or if closed base is also required on the ends. If closed bases are required, specify if for single or double row lockers.

SIMPLIFIED LIST OF LOCKER SIZES

(In Accordance with Simplified Practice Recommendation R35-28 of Department of Commerce. All Dimensions are Inches)

SINGLE TIER

Width*	Depth	Height	Maximum overall height, including legs
12	12	60	66
12	15	60	66
12	18	60	66
15	15	60	66
15	18	60	66
18	21	60	66
12	12	72	78
12	15	72	78
12	18	72	78
15	15	72	78
15	18	72	78
18	18	72	78
18	21	72	78

DOUBLE TIER

Width*	Depth	Height	Maximum overall height, including legs
12	12	30	66
12	12	36	78
12	15	36	78
15	15	36	78
12	15	42	90
15	15	42	90

MULTIPLE TIER (BOX)

Lockers per stack	Wdth.*	Dpth.	Hght.	Max. overall height, including legs
5 or 6 high	12	12	12	66 or 78
5 or 6 high	12	15	12	66 or 78
4	15	15	15	66
5	15	15	14⅖	78

* This dimension does not include the projecting bolt heads. When filling fixed spaces with rows of lockers, allowance should be made for such projections.

ACCEPTABLE SPECIALS

For those who find that the "simplified list of locker sizes" will not satisfactorily fill their requirements, the following acceptable specials can be manufactured with reasonable economy.

SINGLE-DOUBLE TIER

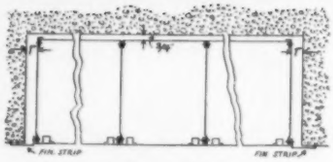
Widths:	9—12—15—18—24
Depths:	12—15—18—21—24
Heights, single tier:	60—72
Heights, double tier:	30—36—42

MULTIPLE TIER

Widths:	12—15—18	
Depths:	12—15—18—21	
Heights:	12 built 5 or 6 lockers high	
	15	4 lockers high
	14⅖	5 lockers high
	18	4 lockers high
	20	3 lockers high
	21	4 lockers high
	24	3 lockers high

METHODS OF LOCKER INSTALLATION

RECESSED, WITH TOP AND END FINISHING STRIPS

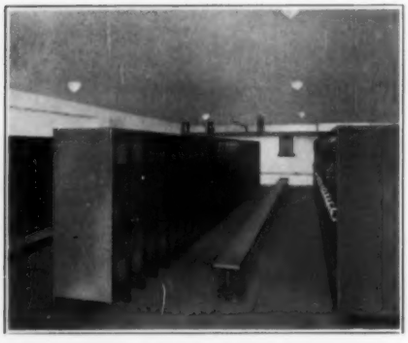


Floor Plan

End View

One of the most economical and attractive arrangements of lockers is the recessed corridor method. It utilizes space that might otherwise be wasted. It beautifies corridors because the lockers may be blended and harmonized with the decorative scheme. When lockers are recessed, it is necessary to close up the top and ends of recesses where the lockers fit in. For this purpose we furnish steel finishing strips enameled in the same color as the locker. Illustrations on page 337 show how concealed joint clips are used to engage top and end strips or adjoining top strips. This eliminates unsightly screw heads on exterior surface. When joint clips are engaged, there is a spring contact holding the finishing strips in alignment with a smooth, flush butt joint, making a finishing strip free from exposed screw heads. Details of typical installations are given on page 344.

Note: Recessed type lockers are made without legs. When building recesses, the width should be 2 ins. greater than total nominal width of lockers. Depth of recess should be at least ¾ in. greater than depth of lockers. Height should be approximately 1½ in. greater than height of lockers.



FREE STANDING

While the trend today leans more to the recessed type of locker installation, there are places where recessing cannot be done to best advantage. This is particularly true of school buildings already erected, and in factories, clubs, gymnasiums, Y. M. C. A.'s, lodge halls and other places not having sufficient corridor space to house built-in lockers. For such buildings, we recommend installations of single row lockers (usually placed with back to wall) or double row lockers (back to back) with the legs which are standard on Durabilt Lockers. These legs are integral with the frame and have adjustable feet to take care of any floor unevenness or slope. See details of typical installations on page 345.

WITHOUT LEGS, ON CEMENT BASE

It is oftentimes desirable to have the lockers furnished without legs and elevated or set on cement bases for sanitary purposes as well as for neat appearance. Either single row or double row lockers can be placed on cement or terrazzo bases (see typical installation details on page 345). Gymnasium Basket Racks can likewise be furnished for setting up in the same manner. In such installations, lockers should be requested without legs and bases should be detailed in building plans. The regularly accepted height of cement bases for all purposes is approximately 6 ins. The width and length of the base depends, of course, on the grouping and number of lockers to be installed.

SLOPING TOP AND/OR CLOSED BASE

Where extreme fire hazards exist, or where placing of anything on top of lockers would be objectionable, sloping tops are available. For free standing lockers, where it is desirable to eliminate collection of dirt, papers, etc., under lockers, base closing plates are furnished which close the space at the front and sides between bottom of locker and floor. Sloping Tops may be had for all lockers and can be used alone or in combination with the Closed Base. Details are given on page 344.

COMPLETE ERECTION INSTRUCTIONS FURNISHED

We can erect lockers in the field, or furnish erection superintendent to supervise other workmen in erecting the lockers. Comprehensive instructions, however, are supplied with each order of lockers which enable customers to effect economies by handling their own installations.

TYPES OF DURABILT STEEL LOCKERS

SINGLE TIER LOCKERS

Single Tier

Single Tier lockers provide service in a most convenient form. They are available in the practical heights of 60 or 72 ins. and in the various widths and depths given in the table on page 339.

A Single Tier locker of small dimensions, say 12 ins. wide, 12 ins. deep and 60 ins. high (not including the legs), capably takes care of any ordinary requirements for individual use. The size of the locker, however, should be increased in such cases as school "team" rooms, gymnasiums, etc., in order to make the storing of athletic uniforms, equipment, etc., more convenient. The Single Tier locker is regularly provided with a hat shelf. Because this shelf decreases the space for hanging clothes, authorities generally prefer the 72-in. locker, for the average use, better than the 60-in. locker. Space limitations determine, of course, the size and number of the Single Tier lockers to be installed, but competent planning and careful use of available floor space will reveal the surprising adaptability of this type of locker to orderly and efficient locker rooms.

Standard equipment for Single Tier lockers includes the hat shelf, one double prong ceiling hook and three or more single prong side hooks, depending on size of locker. Equipment can be varied to meet individual requirements for such lockers as the Armory, Police, Lodge, etc., shown on page 343. Specifications are given on page 346.

DOUBLE TIER LOCKERS

Double Tier

The Double Tier locker is economical as to space and cost. Necessarily, it is more cramped and provides less storage capacity. This type of locker, however, is ideally suited to conditions where large storage space is not required such as for smaller and younger pupils in grade schools. Double Tier lockers are often used in combination with Single Tier or Multiple Tier lockers to form units that meet the storage problems of almost any unusual condition. In schools, gymnasiums, clubs, etc., Double Tier lockers are often utilized for the storage of gym shoes. In such use, standard equipment is replaced by partitioned shoe compartments, 6 x 6 ins.; the capacity is from 10 to 18 compartments per locker, according to locker size. While 6 x 6 ins. is the accepted size for shoe compartments, other sizes that work out on multiples can be furnished. Single Tier lockers may also be thus utilized.

Multiple Tier (Box)

Standard equipment is the same as for Single Tier lockers, with the hat shelf omitted. Specifications are given on page 346, sizes on page 339.

MULTIPLE TIER (BOX) LOCKERS

Multiple Tier (Box), or small compartment lockers as they are sometimes called, have a wide field of usefulness. They can be used to advantage wherever small storage space is required. In schools, gymnasiums, clubs, etc., they are ideal for storing gym suits and shoes, books, lunches, etc. In factories, offices, stores, etc., they are widely used for storing small tools, work shoes, overalls, etc. In combination with Single Tier or Double Tier lockers, they are especially popular.

Like all Durabilt Lockers, they can be furnished for recessing in walls, in single row for arrangement along the walls or in double row or back to back arrangement. They come in tiers three or more high and as many lockers wide as space or requirements permit. No shelves or hooks are furnished with Multiple Tier (Box) lockers. Specifications will be found on pages 346 and 347; sizes on page 339.

GYMNASIUM LOCKERS

While in many schools, clubs, lodges, etc., having gymnasiums the average requirements can be taken care of by Double and Multiple Tier lockers arranged according to conditions, the modern trend is toward a combination arrangement shown in the illustration. This type is usually termed "Gymnasium Locker Unit." A complete unit consists of one standard Single Tier locker in combination with double tier lockers, two high, in sections two, three or four wide. Multiple Tier (Box) lockers can be added, of course, to suit individual requirements.

Gymnasium Locker Unit

Standard equipment consists of one hat shelf in large compartments. All compartments have one double prong ceiling hook and three or more single prong side hooks depending on size of locker. Various combinations consisting of Single Tier lockers, Double Tier lockers, two or three high and Multiple Tier lockers can be made up. Specifications are given on page 347.

GYMNASIUM LOCKER SIZES

(Dimensions are in inches)

Large Compartments W. D. H.*	Small Compartments
12 x 12 x 60	6 x 12 x 30 Double Tier Arrangement
12 x 15 x 72	6 x 15 x 36 Double Tier Arrangement
15 x 15 x 60	7½ x 12 x 30 Double Tier Arrangement
15 x 15 x 72	7½ x 15 x 36 Double Tier Arrangement
	9 x 12 x 20 Triple Tier Arrangement
	9 x 15 x 24 Triple Tier Arrangement

* Overall height, including legs, is 6 ins. greater.

LOCKER ROOM BENCH TOPS AND PEDESTALS

Quite often, customers want to purchase their locker room benches locally, while others prefer that we furnish them. In order to extend complete service to our customers we are prepared to furnish Bench Tops and Pedestals as follows:

Locker Room Bench (Bench Top and Pedestals)

Bench Tops

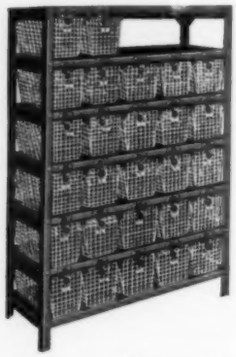
Yellow pine seems to be the most popular wood for locker benches and, unless otherwise specified, we will always furnish it. Our bench tops are carefully sanded with rounded corners and edges, and finished with one coat of shellac and one coat of varnish. Ordinarily, tops are furnished in 6, 8, 10 or 12 ft. lengths, either 8, 10 or 12 ins. wide and 1½ or 2 ins. thick. (Dimensions are nominal.)

Bench Pedestals

These strong and rigid pedestals are of our special design. They are made with heavy cast iron base and top approximately 7 ins. in diameter, and a strong tubular column 1½ ins. in diameter. There are four holes in the base and four in the top for attaching to floor and bench. Finish is baked-on black japan. Pedestal weighs approximately 7 lbs. Standard overall height is 16½ ins. but other sizes can be furnished. Pedestals should be placed 1 ft. from each end of bench top and not more than 5 ft. apart. When ordering, always give size of benches and quantity of pedestals required.

Pedestal

BASKET RACKS AND TRUCKS



Single Row, Skeleton Type Rack

Double Row, Solid Ends Truck

The use of steel racks and wire baskets is often preferred to Multiple Tier (Box) lockers. This system is less expensive and gives the advantages of complete ventilation and makes the contents visible for inspection at any time. The security and orderly appearance of the box lockers is, of course, sacrificed to some extent. The illustration at the left shows the single row, skeleton type, Basket Rack with baskets in place. This rack has a capacity of 30 baskets and consists of steel shelves with angle uprights, basket separators and padlock hasps which permit locking of the baskets in place. The illustration at the right shows the double row Basket Truck, built with solid ends and casters instead of legs, for portability. Basket Racks can be furnished with legs or without legs, the latter arrangement for the purpose of setting the racks up permanently on cement or terrazzo bases. They can be set up in single row arrangement or built for double row arrangement. Racks may vary to accommodate 30 to 48 baskets each; Trucks, 60 to 84 baskets each. Specifications on page 347.

BASKET RACKS

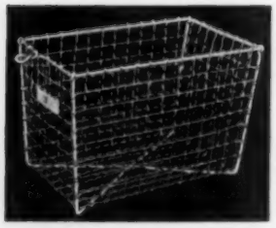
Capacity		W. D. H.
30 baskets 8½x13x8½"	(5 wide x 6 high)	47x13½x61¼"
35 baskets 8½x13x8½"	(5 wide x 7 high)	47x13½x71¼"
40 baskets 8½x13x8½"	(5 wide x 8 high)	47x13½x81¼"
36 baskets 8½x13x8½"	(6 wide x 6 high)	56x13½x61¼"
42 baskets 8½x13x8½"	(6 wide x 7 high)	56x13½x71¼"
48 baskets 8½x13x8½"	(6 wide x 8 high)	56x13½x81¼"
30 baskets 11½x13x8½"	(5 wide x 6 high)	62x13½x61¼"
35 baskets 11½x13x8½"	(5 wide x 7 high)	62x13½x71¼"
40 baskets 11½x13x8½"	(5 wide x 8 high)	62x13½x81¼"

Heights listed above do not include 4¾-in. legs.

BASKET TRUCKS

Capacity	W. D. H. Overall
60 baskets 8½x13x8½" ..... 5 wide x 6 high Double Row.	47x27x65"
84 baskets 8½x13x8½" ..... 6 wide x 7 high Double Row.	56x27x75"
60 baskets 11½x13x8½" ..... 5 wide x 6 high Double Row.	62x27x65"
84 baskets 11½x13x8½" ..... 6 wide x 7 high Double Row.	74x27x75"

WIRE BASKETS



Because of the rough treatment wire baskets receive, we designed the exceptionally strong basket illustrated, for use in Durabilt Basket Racks and Trucks. It is made of 1 in. square mesh No. 15 gauge wire, with 3/16-in. top frame and ⅛-in. diagonal braces. To prevent rust, baskets are finished with a heavy coating of tin after manufacture. Special padlock loop in top frame holds basket in line with front of shelf when padlock is attached. A brass, satin nickel finished number plate is riveted on one end approximately 2 ins. from top edge.

Standard sizes are: 8½ ins. wide x 13 ins. deep x 8½ ins. high; 11½ ins. wide x 13 ins. deep x 8½ ins. high. Can be furnished in ¾ and 1 in. mesh. See specifications on page 347.

COMBINATION LOCKERS

Combination coat and hat lockers (sometimes referred to as compartment lockers) provide unusually convenient service and are conserving of floor space. They are particularly desirable for railroad offices, department stores, telephone exchanges, or wherever women are employed. Each compartment and "box" locker is equipped with a lock that is master-keyed. The key for each small hat compartment operates the lock on its corresponding coat compartment giving access to both by the use of one key.

Durabilt Combination lockers, either 6, 7 or 8 person, can be placed against the wall, or back to back in various group arrangements. For sizes and standard equipment, see specifications on page 347.

7-Person Combination Locker

DOUBLE DOOR GOLF LOCKERS

In general, the design, construction, material and finish of Double Door Golf Lockers is the same as our standard Single Tier lockers except that double doors are hinged to swing right and left. They have a vertical partition, one standard shelf, one combination shelf and golf ball tray, coat rod, golf bag chain, and one small box compartment fitted with frame and hinged door which can be locked, giving added protection to valuable personal effects. Golf lockers can be furnished in various sizes and styles with or without special equipment such as drawer at bottom, mirrors, comb-trays, towel rods, umbrella racks, drip pans, golf ball trays, golf bag chains, single or double doors, etc.

SIZES
(Dimensions are in inches)

W. D. H.*	W. D. H.*	W. D. H.*
24x18x60	24x24x60	24x21x72
24x21x60	24x18x72	24x24x72

* Overall height, including legs, 6 ins. greater.

LOCKERS WITH TRAYS

Adapted to innumerable uses wherever small objects are to be stored or classified. Individual trays easily removed. Equipment consists of nineteen 3-in. trays in the 60-in. high locker and twenty-three 3-in. trays in the 72-in. high locker. Lockers can be furnished with doors, also without legs. Trays are No. 24 gauge steel. Tray equipment consists of two guides, one cadmium plated drawer pull number plate, and label holder. Special shelf with ⅜-in. hemmed flange at front is furnished above each tray.

OVERALL SIZES
(Dimensions are in inches)

W. D. H.*
12x15x60
12x15x72

* Add 6 ins. for length of legs.

KEY CABINETS

Small size has 100 hooks on back; inserting one swinging leaf provides 200 and panel on door provides 100 additional hooks. Two leaves can be added. Large size Cabinet has twice as many hooks. Adjustable or fixed hooks hold *five locker keys*. Number is stamped in white above each hook to correspond with locker numbers. Can be locked with any of our standard locks or padlocks. "School Furniture" brown or "Satin Texture" olive green baked enamel finishes. Other colors at extra cost.

SIZES
(Dimensions are in inches)

W. D. H.
15x6x30
24x6x30

OTHER TYPES OF DURABILT STEEL LOCKERS

This page shows but a few of the many other types and combinations of lockers available in the Durabilt line. They are of the same sturdy construction and materials as all Durabilt Lockers previously described. They are offered in evidence of the fact that in Durabilt you are assured of finding the solution to your locker problems.

TWO PERSON LOCKERS

W	D	H*
15x12x60″		
15x15x60″		
15x18x60″		
15x12x72″		
15x15x72″		
15x18x72″		
15x21x72″		

Equipment consists of two hat shelves, vertical partition dividing lower part into two coat compartments each having one double prong ceiling and two or more single prong side hooks, depending on size of locker. Can be furnished without partition when desired.

TWO-IN-ONE LOCKERS

W	D	H*
15x15x72″		without coat rod
15x18x72″		with coat rod
15x21x72″		with coat rod

Coat compartments are 7½″ wide x 54″ high. Hat compartments are 15″ wide x 9″ high, making total height of section 72″ *exclusive of legs.*

Equipment — One double prong ceiling hook and two or more single prong side hooks, depending on size of locker. Lockers 18″ deep and over have a coat rod in addition to hook equipment.

DUPLEX LOCKERS

W	D	H*
15x15x72″		
15x18x72″		
15x21x72″		

Two lockers in special 15″ wide frame. Each locker 7½″ wide. Provides 2835 cu. in. capacity in 18″ deep locker.

Equipment — 1 hat shelf spaced 21″ down from top, one single prong coat hook above shelf; one double prong ceiling hook bolted to shelf and 2 or more single prong hooks below shelf. Coat rods can also be furnished. Requires only 2 locks. Very economical and conserves floor space.

DOUBLE TIER SHOE LOCKERS

W	D	H*	No. of 6″x6″ openings
12x12x30″			10
12x15x30″			10
12x12x36″			12
12x15x36″			12
18x12x36″			18
18x15x36″			18

Double Door Shoe Lockers

These can be furnished in 30″ and 36″ widths, in either 60″ or 72″ heights having compartments nominally 6″ wide x 6″ high.

SINGLE TIER SHOE LOCKERS

W	D	H*	No. of 6″x6″ openings
12x12x60″			20
12x15x60″			20
18x12x60″			30
18x15x60″			30
24x12x60″			40
24x15x60″			40
12x12x72″			24
12x15x72″			24
18x12x72″			36
18x15x72″			36
24x12x72″			48
24x15x72″			48

While 6″x6″ is the accepted size for shoe compartments, other sizes in proper multiples can be furnished.

SINGLE DOOR GOLF LOCKERS

W	D	H*	W	D	H*
15x15x72″			18x18x72″		
15x18x72″			18x21x72″		

Equipment is as follows (but may be varied to meet individual requirements) — 7″x9″ tilting mirror, comb and brush tray, towel rod, umbrella rack, drip pan, combination hat shelf and golf ball tray, coat rod, one double prong ceiling hook, four or more single prong side hooks (depending on size of locker), golf bag chain, shelf and drawer at bottom.

SINGLE DOOR STORAGE LOCKERS

(With Stationary Shelves)

W	D	H*	W	D	H*
15x15x60″			15x15x72″		
15x18x60″			15x18x72″		
18x18x60″			18x18x72″		
18x21x60″			18x21x72″		
18x24x60″			18x24x72″		

Equipment consists of four stationary shelves spaced equidistant unless otherwise specified at time of ordering. More shelves can be furnished if required. Can be had with adjustable shelves.

DOUBLE DOOR WARDROBE LOCKERS

W	D	H*	W	D	H*	W	D	H*	W	D	H*
30x15x60″			36x15x60″			30x15x72″			36x15x72″		
30x18x60″			36x18x60″			30x18x72″			36x18x72″		
30x21x60″			36x21x60″			30x21x72″			36x21″72″		
30x24x60″			36x24x60″			30x24x72″			36x24x72″		

Equipment consists of adjustable wardrobe shelf assembly with a coat rod and six double prong ceiling hooks.

This locker can easily and quickly be converted into a spacious storage locker by removing the wardrobe shelf assembly and inserting the desired number of storage shelves.

OFFICE LOCKERS

W	D	H*	W	D	H*
12x18x60″			15x15x72″		
15x18x60″			15x18x72″		
18x21x60″			18x18x72″		
12x18x72″			18x21x72″		

Equipment is as follows: hat shelf, coat rod, one double prong ceiling hook, three or more single prong side hooks (depending on size of locker), 7″x9″ tilting mirror, comb and brush tray, towel rod, umbrella rack and drip pan.

ARMORY LOCKERS

W	D	H*	W	D	H*
15x18x72″			18x21x72″		
18x18x72″			18x24x72″		

Small compartment is 15″ high and large compartment is 57″ high or a total height of 72″ exclusive of legs.

Large compartment has coat rod, one double prong ceiling hook, four or more single prong side hooks (depending on size of locker), and clips for holding rifle.

LODGE LOCKERS

W	D	H*	W	D	H*
15x18x72″			18x21x72″		
18x18x72″					

Equipped with shelf for cap and baldric, coat rod, one double prong ceiling hook, four or more single prong side hooks (depending on size of locker), chapeau rack and clips for sword and scabbard.

POLICE LOCKERS

W	D	H*	W	D	H*
18x18x72″			18x24x72″		
18x21x72″			24x24x72″		

Equipment consists of hat shelf, coat rod, one double prong ceiling hook, four or more single prong side hooks (depending on size of locker), shoe rack and card holder on door to take card 1⅛″x1¾″.

UNIT CONTROLLED GROUP LOCKERS

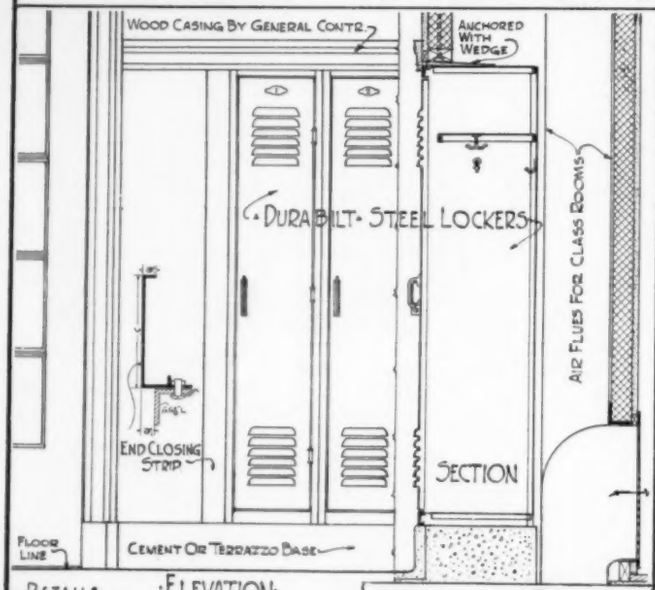
Entire group of lockers can be locked or unlocked by operating control lever mechanism in master locker (first locker at left of group). This master locker can be locked with any type standard locker lock or padlock, either key or combination.

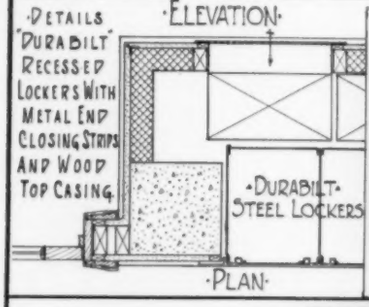
Group control mechanism can be made inoperative, so that lockers may be locked individually, if desired.

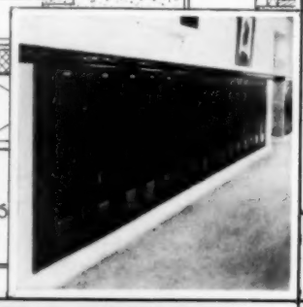
Ideal for corridor, classroom, or locker room installation. Gives teacher or monitor absolute control of every locker. Write for complete information, detailed drawings, specifications, etc.

* Overall height, including legs, is 6 ins. greater.

DETAILS OF TYPICAL DURABILT LOCKER INSTALLATIONS

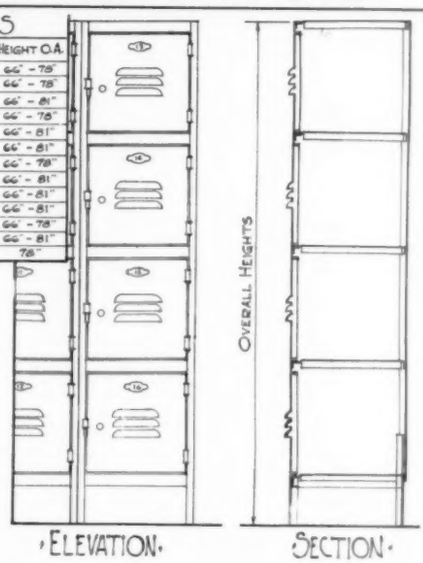


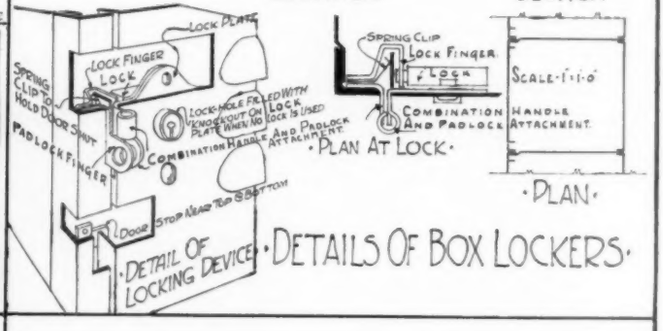


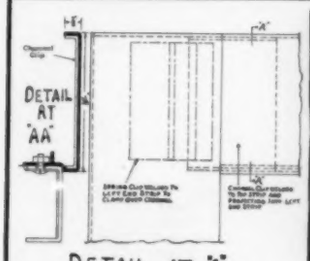


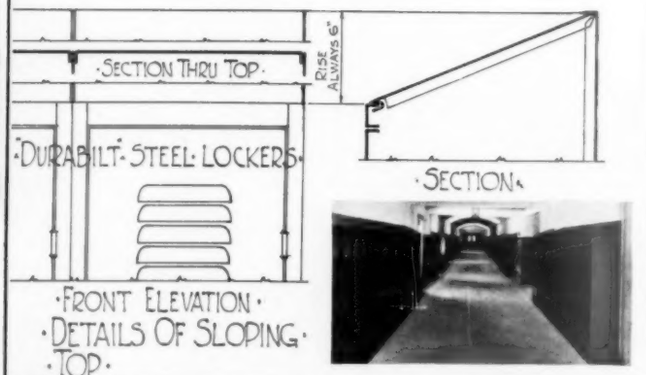
PREFERRED SIZES

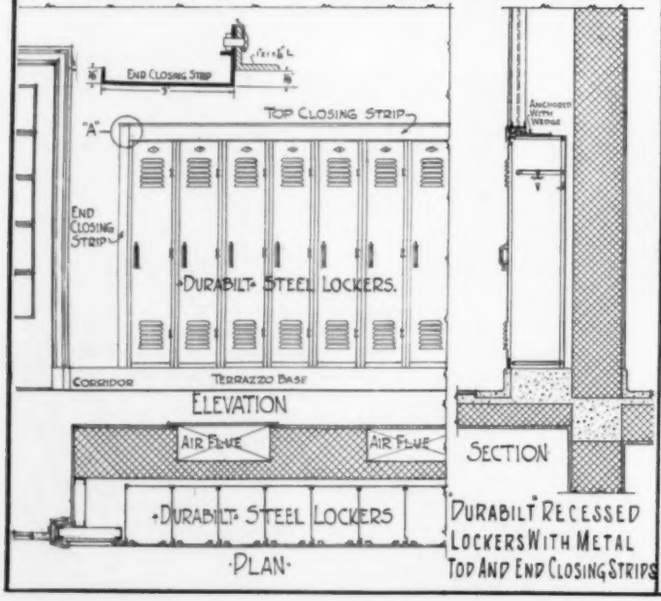
WIDE	DEEP	HIGH	TO ASSEMBLE	HEIGHT O.A.
12"	12"	12"	5-6 HIGH	66" - 78"
12	18	12	5-6 "	66" - 78"
12	15	15	4-5 "	66" - 81"
12	18	12	5-6 "	66" - 78"
18	12	15	4-5 "	66" - 81"
15	15	15	4-5 "	66" - 81"
15	18	12	5-6 "	66" - 78"
15	18	15	4-5 "	66" - 81"
15	21	15	4-5 "	66" - 81"
18	15	15	4-5 "	66" - 81"
18	18	12	5-6 "	66" - 78"
18	18	15	4-5 "	66" - 81"
18	18	18	4 "	78"

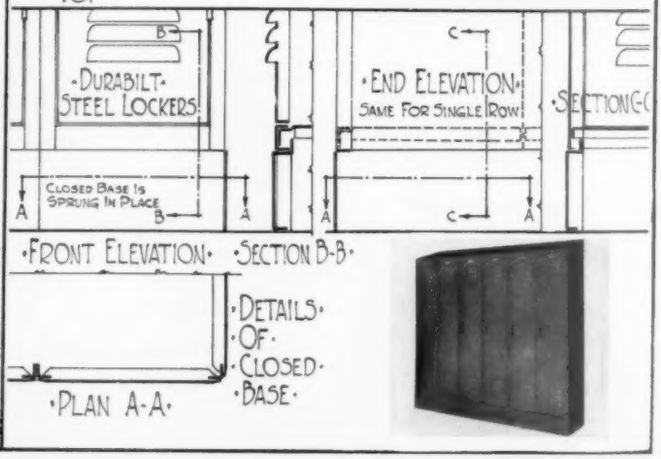




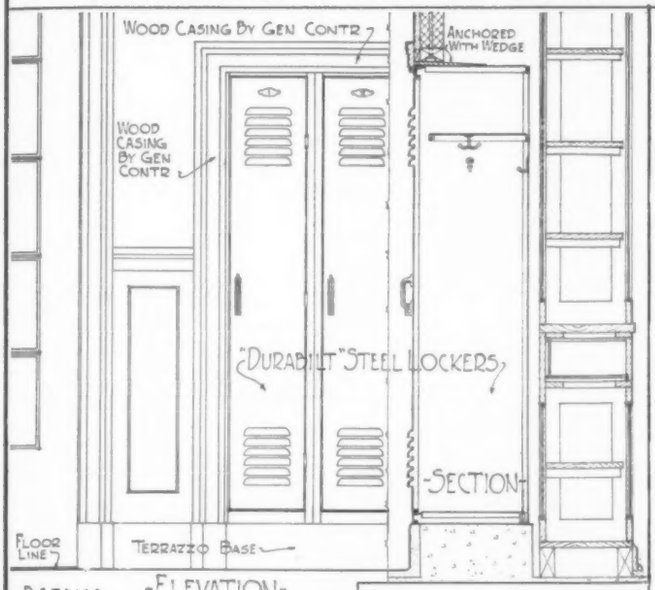


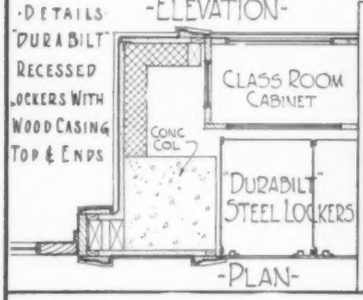


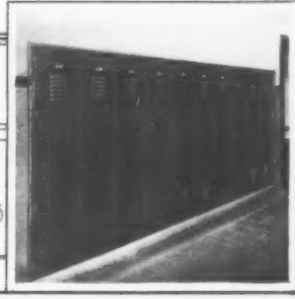


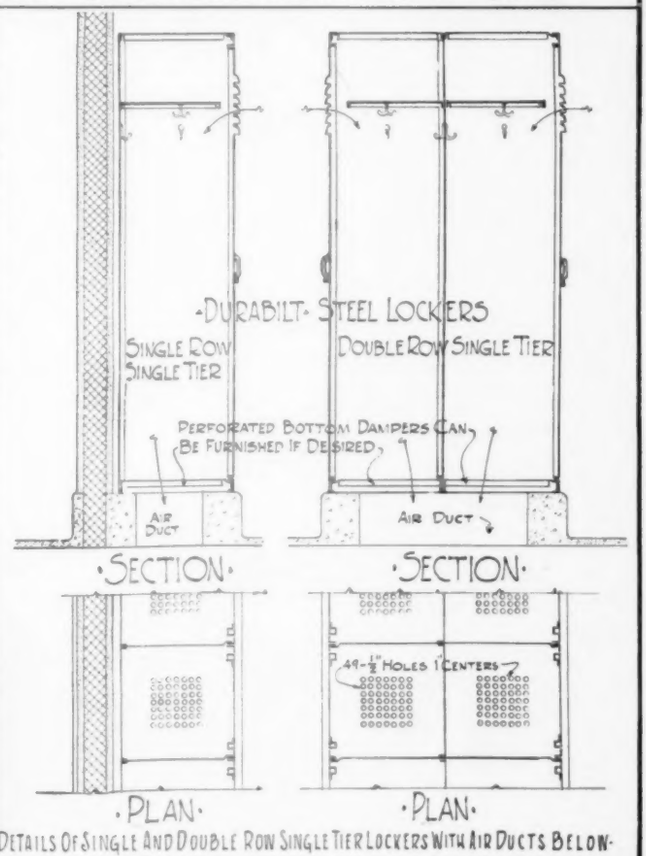


DETAILS OF TYPICAL DURABILT LOCKER INSTALLATIONS

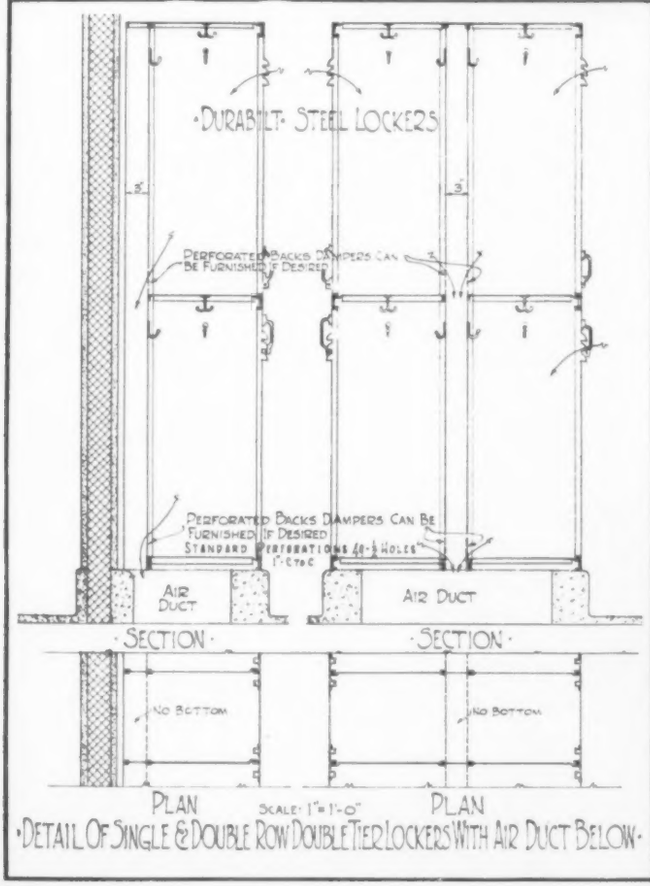




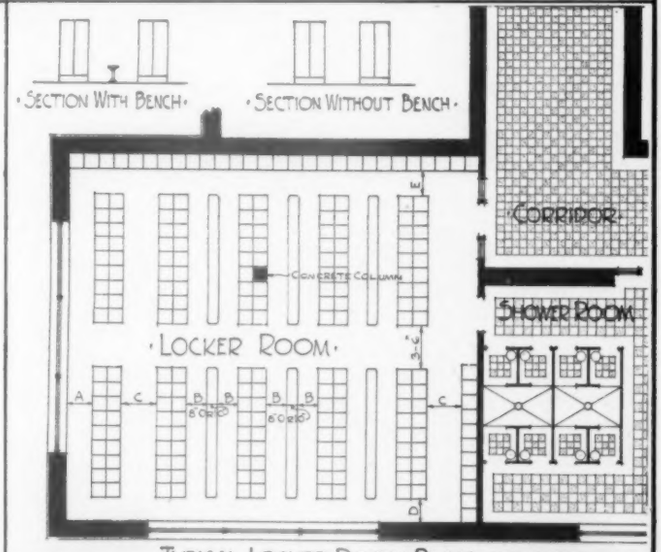




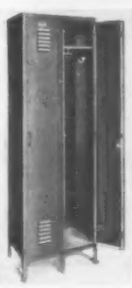
DETAILS OF SINGLE AND DOUBLE ROW SINGLE TIER LOCKERS WITH AIR DUCTS BELOW·



·DETAIL OF SINGLE & DOUBLE ROW DOUBLE TIER LOCKERS WITH AIR DUCT BELOW·



·TYPICAL LOCKER ROOM PLAN



·RECOMMENDED DIMENSIONS·
"A" WIDTH OF LOCKER + 12"
"B" WIDTH OF LOCKER + 6"
"C" 2 x WIDTH OF LOCKER + 6"
"D" AT LEAST 24"
"E" WIDTH OF LOCKER + 18"

·SINGLE TIER LOCKERS· ·DETAIL OF LOCKER BENCH· ·DOUBLE TIER LOCKERS

GENERAL OR "OPEN" SPECIFICATIONS

STANDARD LOCKERS

Doors—Shall be of 16 gauge steel with tubular reinforcement to house locking mechanism, adequately reinforced on hinge side and flanged on top and bottom edges; or may be of No. 20 gauge steel adequately reinforced and stiffened with welded tubular reinforcements at each vertical edge, with top and bottom edges hemmed 1½ ins. and flanged ¾ in. and welded at corners. Steel for doors shall be full cold-rolled patent-level enameling stock, or equivalent, free from surface irregularities and capable of taking a high grade enamel finish.

Door Frames—Uprights shall be 1 x 1 x ⅛-in. hard steel angles, or approved construction of equal strength. Cross members shall be 1½ x ¾-in. No. 14 gauge formed steel channels, joined to uprights at each end by two 3/16-in. countersunk head rivets or by welding; or may be of steel angle or other approved construction of sufficient strength to form a substantial rigid frame.

Body—Sides, backs, tops, bottoms and shelves shall be no lighter than No. 24 gauge cold-rolled steel.

Unlocking Device—Doors to be equipped with unlocking device with pre-locking features so that doors in closed position are always locked unless manually unlocked, or approved equal. This device to be so constructed that raising of handle silently disengages lock fingers allowing locker door to be opened and to prevent accidental locking of door in open position.

Locks—All lockers shall be furnished with master keyed flat key (grooved key or paracentric may be specified if desired) locks of standard manufacture with two keys for each lock (if combination locks are called for they should be of a size and type interchangeable with the standard flat key locks). (Padlocks either of flat key type or combination type can be furnished when specified.)

Hinges—Shall be of the type known as full-looped, with five knuckles and shall be at least 1½ ins. in width, attached to the door frame with two 3/16-in. countersunk head rivets and to door with two 14-20 binder head machine screws and nuts. If "butt" hinges are used, they shall be sufficiently larger and heavier to afford equal strength. All hinges shall be so positioned that pins cannot be driven out. There shall be three hinges on single tier and two on double tier locker doors.

Legs—Where called for, legs shall extend at least 4½ ins. clear below cross member of door frame. Front legs shall be integral with frame and be provided with detachable adjustable floor plates and the rear legs shall be individually adjustable for height. (When specified on lockers with legs—closed bases are to be furnished for the fronts and ends of locker sections. These shall be no lighter than No. 20 gauge cold-rolled steel and so attached to present a neat appearance, preferably without any exposed bolt heads.)

Note: When lockers are to be placed on raised bases, they should be furnished without legs.

Tops—All lockers shall have flat tops (unless sloping tops are specified).

Ventilation—(*Standard—Doors Only*) Doors shall have standard louvre perforations, not less than six louvres near top and bottom of single tier lockers, and three near top and bottom of double tier lockers.

(*Alternates—Doors Only*) (a) Doors shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near top and bottom.

(b) Doors shall have louvre perforations their full length.

(c) Doors shall have ½-in. round holes on 1-in. centers, or equivalent, their full length.

(*Special Ventilation—When Specified*) (a) Single Tier Ventilated Types.

(1) Tops (or backs near top) of lockers shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent. Louvres near top of doors shall be omitted.

(2) Bottoms (or backs near bottom) of lockers shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent. Louvres near bottom of doors shall be omitted.

(b) Double Tier Ventilated Types.

(1) Tops and Intermediate Tops (or backs near top) of lockers shall each have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent. Louvres shall be omitted from doors except at bottom of lower door.

(2) Bottoms and Intermediate Bottoms (or backs near bottom) of lockers shall each have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent. Louvres shall be omitted from doors except at top of upper door.

(3) Single Row Double Tier lockers shall be provided with a 3-in. ventilating space behind regular back connecting with an air duct beneath lockers (air duct by others). Ventilating space shall be formed by extending ends and tops 3 ins. beyond nominal dimensions at back and providing an extra back, or equivalent arrangement. Regular backs shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near bottom of each locker. Louvres near bottom of doors shall be omitted.

(4) Double Row Double Tier Lockers shall be assembled in single row arrangement providing a 3-in. ventilating space between backs of lockers. This space shall be formed by extending the tops and ends 3 ins. beyond nominal dimensions at the back, or equivalent arrangement, and shall be connected with air duct beneath lockers (air duct by others). Backs of lockers shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near bottom. Louvres near bottom of doors are to be omitted.

Note: Adjustable damper plates can be furnished with round hole perforations when specified.

Equipment—Single tier lockers shall have one hat shelf, approximately 9 ins. below top of locker, double tier lockers none. All lockers shall have one double prong ceiling hook and at least one single prong side hook on each side and back, preferably of the type that are attached with two screws.

Finish—All lockers shall be finished with "school furniture" brown or olive green baked enamel. (Other colors at reasonable extra cost, when specified.) Door handles cadmium plated (chromium optional) padlock attachment enameled same color as locker door. Coat hooks shall be of cadmium finish or otherwise thoroughly rust-proofed. All screws and nuts shall be rust-proofed by the Udylite or Parker process. Where screw heads are visible on outside of locker they shall be of the slotless or binder-head type.

Number Plates—Each locker shall have a brass satin nickel finished, or aluminum number plate with black filled depressed numbers not less than 7/16 in. high; plates to be attached with split rivets.

Workmanship—Shall be of strictly high grade character throughout. All like parts shall be standard and interchangeable, accurately formed and correctly fitted.

Because of the increased demand for lockers recessed in the corridor walls, we list below typical specification clauses for the various standard arrangements, viz.:

Metal Top and End Strips—Lockers are to be placed in recesses provided for them, and the locker contractor is to furnish recess finishing strips to cover the gap at the ends and across the top of each locker section. These strips are to be made of No. 16 gauge full cold-rolled, patent leveled special enameling steel approximately 3 ins. wide so attached to present a neat smooth finish, preferably with concealed joint clips where top strips or top and end strips join together.

Wood Top and Metal End Strips—Lockers are to be placed in recesses provided for them and the locker contractor is to furnish recess finishing strips to cover the gaps at the ends of each locker section. These strips are to be made of No. 16 gauge full cold-rolled, patent leveled special enameling steel approximately 3 ins. wide so attached to present a neat smooth finish. Wood recess closing strips are to be furnished to cover the gaps across the top of each locker section by the general contractor.

Wood Top and End Strips—The lockers are to be placed in recesses provided but the gaps at the ends and across the top of each locker section are to be covered by wood moulding not included in these specifications.

MULTIPLE TIER (BOX) LOCKERS

Doors—Shall be made of not less than No. 16 gauge steel, flanged on all edges. Steel for doors shall be full cold-rolled, patent-leveled enameling stock, or equivalent, free from surface irregularities and capable of taking a high grade enamel finish.

Door Frames—Uprights shall be 1 x 1 x ⅛-in. hard steel angles or approved construction of equal strength. Top and bottom cross members shall be 1½ x ¾-in No. 14 gauge formed steel channels and intermediate cross members between door openings shall be 1½ x ¾-in. No. 20 gauge formed steel channels, joined to uprights at each end by two 3/16-in. countersunk head rivets or by welding, or may be of steel angle or other approved construction of sufficient strength to form a substantial rigid frame.

Body—Sides, backs, tops and bottoms—*same as Standard Lockers.*

Locking Device—Shall be simple, substantial, and tamper-proof, preferably with neatly formed stamped steel (not cast) straight pull curl handle combined with padlocking attachment consisting of a plate with hasp attached to door adjacent to similar plate attached to frame so door cannot be opened when padlock is affixed. (Unless hereinafter specified padlocks are not included in these specifications.) When doors are closed, spring clips or other approved arrangement shall keep them shut.

Locks—*Same as for Standard Lockers.*

Hinges—*Same as for Standard Lockers, but replacing last sentence with:* There shall be at least two hinges on all box locker doors.

Legs—*Same as for Standard Lockers.*

Tops—*Same as for Standard Lockers.*

Ventilation—(*Standard—Doors Only*) Each door shall have not less than three louvre perforations near center of door. Louvres shall be preferably 4½ ins. wide by ⅜ ins. deep to afford maximum circulation of air.

(*Alternate—Doors Only*) Each door shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near center of door.

(*Special Ventilated Types—When Specified*) (a) Each back shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, in center of each compartment.

(b) Tops and intermediate tops shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near center of top.

(c) Bottoms and intermediate bottoms shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near center of bottoms.

Note: Combinations of above types of ventilation can be furnished when specified.

Equipment—No hooks or shelves included unless specified.

Finish—*Same as for Standard Lockers, but without mention of Door Handles, Padlock Attachments or Coat Hooks.*

Number Plates—*Same as for Standard Lockers.*

Workmanship—*Same as for Standard Lockers.*

COMBINATION (COMPARTMENT) LOCKERS

Doors—*Same as for Standard Lockers, adding:* Small doors shall be of not less than No. 16 gauge steel flanged on all edges.

Door Frames—*Angles same as for Multiple (Tier) Box Lockers.*

Body—*Same as for Standard Lockers.* Sides, backs, tops, bottoms and shelves shall be no lighter than No. 24 gauge cold-rolled steel.

Locking Devices—On large doors—*Balance same as for Standard Lockers.*

On small doors—*Balance same as for Multiple Tier (Box) Lockers.*

Locks—A. (*When used for Industrial, Office or Store Locker Rooms*) All small doors shall be furnished with masterkeyed series, pass key, flat key locks of standard manufacture with two keys for each lock which will also operate lock on large door.

B. (*When used in Gymnasium Locker Rooms*) All small doors only shall be furnished with combination padlocks (or, masterkeyed flat key padlocks of standard manufacture with two keys each).

Hinges—*Same as for Standard Lockers, but replacing last sentence with:* There shall be three hinges on single tier locker doors, and two hinges on double tier and multiple tier (box) locker doors.

Legs—*Same as for Standard Lockers.*

Tops—*Same as for Standard Lockers.*

Ventilation—(*Standard—Doors Only*) Doors shall have standard louvre perforations, not less than six louvres near top and bottom of full length lockers; not less than three louvres near top and bottom of double tier lockers; and not less than three louvres near center of all box-lockers. Louvres shall be preferably 4½ ins. wide and 3/16 in. deep to afford maximum circulation of air.

(*Alternate—Doors Only*) Doors shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near top and bottom of full length and double tier lockers and one block near center of door of all box lockers.

(*Additional Door Ventilation—When Specified*) A. Doors of all full length lockers and all double tier lockers shall have louvre perforations their full length. Box locker doors to have three louvres near center of door. Louvres shall be preferably 4½ ins. wide and 3/16 in. deep to afford maximum circulation of air.

B. Doors of all full length lockers and all double tier lockers shall have ½-in. round holes on 1-in. centers, or equivalent, their full length. Doors of box lockers shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near center of door.

(*Special Ventilated Types—When Specified*) A. Single row combinations of full length and double tier lockers shall be provided with a 3-in. ventilating space behind regular backs connecting with an air duct beneath lockers (air duct by others). Ventilating space shall be formed by extending tops and ends 3 ins. beyond nominal dimensions at the back or equivalent arrangement. Regular backs of all lockers shall have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near bottom of lockers. Louvres near bottom of doors shall be omitted.

B. Double row combinations of full length and double tier lockers shall be assembled in single row arrangements providing a 3-in. ventilating space between backs of lockers. This space shall be formed by extending the tops and ends 3 ins. beyond nominal dimensions at the back or equivalent arrangement, and shall be connected with air duct beneath lockers (air duct by others). Regular backs of all lockers shall have a block of forty-nine ½-in. round holes on 1-in. centers or equivalent, near bottom of lockers. Louvres near bottom of doors shall be omitted.

Note: Compartment lockers consisting of combination of full length or double tier lockers and box lockers may be specially ventilated as above except louvres in doors of box lockers not to be omitted, and backs of box lockers to have a block of forty-nine ½-in. round holes on 1-in. centers, or equivalent, near center of back.

Equipment—(*When Used in Gymnasium Locker Rooms*) Both single and double tier lockers shall have a double prong ceiling hook and at least one single prong side hook on each side and back, preferably of the type that are attached with two screws. Full length lockers shall have one hat shelf 9 ins. below top of locker.

(*When Used in Industrial, Office or Store*) Full length lockers shall have coat rod and six single prong side hooks.

Finish—Door handles and padlock attachments on large lockers same as for standard lockers. Door handles and padlock attachments on small doors same finish as compartment lockers.

Number Plates—*Same as for Standard Lockers.*

Workmanship—*Same as for Standard Lockers.*

Sizes—(Dimensions are given in inches.)

INDUSTRIAL, OFFICE AND STORE

W.xD.xH.	Ratio	Quantity and Size of Large Compartments	Quantity and Size of Small Compartments
36 x21x72	7 to 1	1 — 21x21x60	6 — 15x21x12 1 — 21x21x12
36 x18x72	7 to 1	1 — 21x18x60	6 — 15x18x12 1 — 21x18x12
54 x21x72	8 to 2	2 — 18x21x60	8 — 18x21x12
54 x18x72	8 to 2	2 — 18x18x60	8 — 18x18x12
GYMNASIUM			
34½x12x60	6 to 1	1 — 12x12x60	6 — 7½x12x30
34½x15x60	6 to 1	1 — 12x15x60	6 — 7½x15x30
30 x12x60	6 to 1	1 — 12x12x60	6 — 6x12x30
30 x15x60	6 to 1	1 — 12x15x60	6 — 6x15x30
24 x12x60	5 to 1	1 — 12x12x60	5 — 12x12x12
24 x15x60	5 to 1	1 — 12x15x60	5 — 12x15x12
24 x12x60	7 to 1	1 — 12x12x36	7 — 12x12x12
24 x15x60	7 to 1	1 — 12x15x36	7 — 12x15x12
24 x12x72	6 to 1	1 — 12x12x72	6 — 12x12x12
24 x15x72	6 to 1	1 — 12x15x72	6 — 12x15x12
24 x12x72	7 to 1	1 — 12x12x60	7 — 12x12x12
24 x15x72	7 to 1	1 — 12x15x60	7 — 12x15x12
36 x12x72	12 to 2	2 — 12x12x36	12 — 12x12x12
36 x15x72	12 to 2	2 — 12x15x36	12 — 12x15x12

BASKET RACKS AND BASKET TRUCKS

BASKET RACKS:

Uprights—Shall be open or "skeleton" type with 1x1x⅛-in. hard steel angles or equivalent front and rear, punched for attaching shelves and gussets. (Closed or "solid" type with No. 20 gauge cold-rolled steel between upright members can be furnished when specified.) Upright members shall not be more than 5½ ft. on centers.

Corner Gussets—(Furnished with skeleton type construction only.) Shall be No. 20 gauge steel punched for attaching to uprights and shelves at ends and rear of open or "skeleton" type sections.

Basket Separators—Shall be wing type made of not less than No. 20 gauge special enameling steel bolted to under side of shelves, making individual compartments.

Shelves—Shall be of not less than No. 20 gauge special enameling steel adequately reinforced and having a wide flange at rear to serve as a back stop for baskets.

Backs—Shall be open or "skeleton" type to allow for maximum air circulation. (Closed or "solid" type with not less than No. 20 gauge steel between uprights can be furnished if specified.)

Size of Racks—(Racks may vary to accommodate 30 to 48 baskets each. See page 342 for dimensions.)

BASKET TRUCKS:

Uprights—Shall be full 1x1x⅛-in. hard steel angles or equivalent, punched for attaching shelves and solid end panels. Upright members shall be spaced not more than 6½ ft. over all.

Ends—To be closed or "solid" type, with No. 20 gauge cold-rolled special enameling steel, bolted between upright members.

Dividers—Truck shall be 27 ins. deep over all, with No. 20 gauge cold-rolled special enameling steel, solid lengthwise divider, making 13½ ins. deep basket openings on either side of truck.

Shelves—Shall be of not less than No. 20 gauge cold-rolled special enameling steel adequately reinforced with 1¼-in. flanges front and rear. Bottom shelf to have 1x1x⅛-in. angle reinforcement bolted inside of flanges, front and rear.

Basket Separator—Shall be winged type of not less than No. 20 gauge special enameling steel, bolted to under side of shelves, making individual compartments.

Casters—Each truck shall have four roller bearing casters (two swivel casters at one end and two stationary casters at the other), wheels not less than 3½ ins. in diameter. Casters shall be securely bolted to No. 16 gauge reinforcing plate attached to bottom shelf—said plate to be 6½ ins. wide and to extend entire depth of truck at each end; or construction of equivalent strength.

Size of Trucks—(Trucks may vary to have a capacity of 60 to 84 baskets each. See page 342 for dimensions.)

The following applies to both Racks and Trucks:

Padlock Hasps—Shall be of not less than No. 16 gauge steel formed to provide a secure means of locking the baskets in position.

Number Plates—Each basket opening shall have nickel plated, polished brass or aluminum number plate with black filled depressed numbers not less than 7/16 in. high, plates to be securely attached to the shelves.

Bolts and Nuts—Shall be rust-proofed by the Udylite or Parker process. All outside bolt heads shall be of the slotless or binder head type.

Finish—Racks shall be finished with olive green, or "school furniture" brown baked enamel. (Other colors at reasonable extra cost when specified.)

Workmanship—*Same as for Standard Lockers.*

WIRE BASKETS:

Shall be made of No. 15 gauge wire woven on 1 in. square mesh, reinforced with 3/16-in. wire around top and ⅛-in. wire at upright corners and diagonally across bottom. Baskets shall have a brass, satin nickel finished or aluminum number plate with black filled depressed numbers; and shall be provided with loop for padlock attachment and finished with heavy coating of tin after manufacturing. Standard sizes 8½ in. wide x 13 in. deep x 8½ in. high or 11½ in. wide x 13 in. deep x 8½ in. high.

Instructions for Erecting

We can erect lockers in the field, or furnish erection superintendent to supervise other workmen in erecting the lockers. Comprehensive instructions, however, are supplied with each order of lockers which enable customers to effect economies by handling their own installations.

DURABILT
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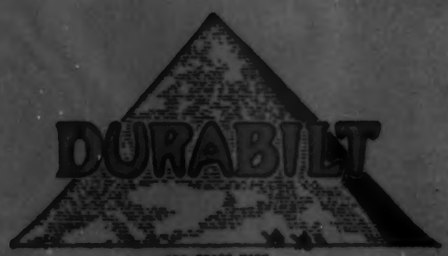

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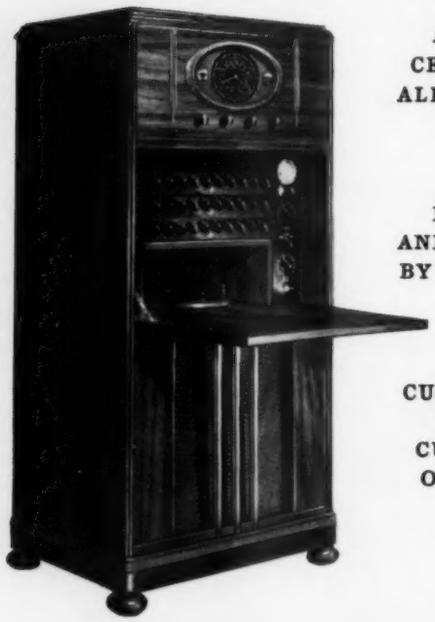
"Everything in Radio"

PUBLIC ADDRESS FOR THE SCHOOL



A TYPICAL CENTRALIZED ALLIED SYSTEM

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DESIGNED AND APPROVED BY EDUCATORS

•

CUSTOM-BUILT TO MEET CURRICULAR OBJECTIVES

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Radio in the school is now a permanently significant factor in education. Comprehensive educational programs must today include the use of Public Address equipment. A Sound System is indispensable for the distribution of educational broadcasts, either from radio or from within the school itself; for radio or speech recording purposes; for simultaneous class announcements or emergency purposes. Further, it can be used effectively for musical and dramatic performances, for gymnasiums, stadiums, outdoor athletic fields, overflow crowds, etc. A dependable Public Address system is an invaluable assistant to school administrators, teachers and students.

The selection of a suitable Sound System is, therefore, a matter of real concern and importance. The individual requirements of the school must be studied carefully by experts; the equipment should be of the highest quality while remaining reasonably low in price, and should be selected in an exacting manner based upon dependable experience. The ALLIED Sound Engineering Division offers you a wide range of experience in handling innumerable school sound projects. Our equipment is the result of careful collaboration between outstanding educators and our own Sound Engineers.

FREE CONSULTING SERVICE

Individual Attention by Competent Engineers

We invite you to submit your Public Address specifications to our Sound Engineering Division for careful, individual consideration and valuable advice, without any obligation on your part. Floor plans, sketches, etc., are desirable; all data will be treated confidentially and returned safely. We maintain a large staff of expert technicians who are in constant communication with educators all over the country and a completely equipped laboratory for studying your problems. We are prepared to quote attractive prices for equipment covering your particular needs. No matter what your Sound problem is—whether complicated or simple, large or small, costly or inexpensive, we shall give it our careful, personal, prompt consideration.

CENTRALIZED SYSTEMS—PORTABLE SYSTEMS—AT BUDGET-MINDED PRICES

A typical centralized ALLIED System is shown at the left—a system distinguished for completeness, future expansion adaptability, outstanding quality and low cost, covering every conceivable school sound need. Invaluable for radio and record distribution, recording, assembly work, general announcements, individual classroom contact, alarms, etc., the basic built-in equipment of this system includes a powerful high-quality amplifier, all-wave radio tuner, 2-speed phonograph, program selector panels, speaker selection and distribution controls, volume level indicator, monitor speaker, and a crystal microphone, all housed in an attractive wood cabinet. This ALLIED system is available for single or dual channel input to operate practically any number of speakers, as well as with "talk back" or "monitor" feature. Designed and approved by educators, it is offered complete at a genuinely "budget-minded" price. Write to us for complete details.

We are prepared to quote attractive prices for complete permanent and portable installations, amplifiers, recording equipment, and for any type of replacement and additional equipment in present Public Address systems. Our extensive experience in serving the leading schools and institutions in the country qualifies us to cope with any Sound problem. ALLIED Public Address systems feature high fidelity of tone, extreme simplicity of installation and operation, dependability, and low cost, both initially and in maintenance.

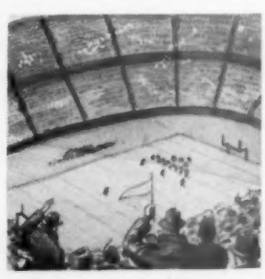
A FEW EXPRESSIONS OF APPROVAL FROM SATISFIED SCHOOL USERS

"We are convinced that there is no equipment more beneficial to a high school than a good public address system. And we have a good one, at an almost unbelievably low cost. . . . Our system has operated perfectly since the first time we used it, and has given no trouble at all. And we have had a lot of very fine comment on the clear, high fidelity noiseless reception, which is practically free of hum. . . . We never have to tune our set. The controls are set, and it reproduces in a clear, natural tone, day in and day out . . . too long a story to explain in detail the numberless ways in which our system has proven its worth. . . . When we think of radio . . . we think of ALLIED . . . I want you to feel perfectly free to refer anyone to me for recommendation of your products. . . ."—W. F. Currington, City Public Schools, Jackson, Ohio.

"Possibly you would be interested to know what results I obtained in using the 50 watt amplifier you recommended for the Sandusky High School Athletic Field. . . . Because the stadium was not entirely completed, I was asked to install the system temporarily for the exercises.

"Under these conditions . . . this makeshift set-up gave ideal results in spite of being called upon for more coverage than was planned for the permanent installation.

"A crowd of 10,000 people heard every word of the ceremonies clearly and distinctly. The opinion was voiced by many fans that it was the best P.A. system they had ever heard."—Len Winkler, Sandusky, Ohio.



FROM COAST TO COAST—A PARTIAL LIST OF SCHOOLS USING ALLIED SOUND EQUIPMENT

North

Carson Military and Naval Preparatory Institute, Detroit, Mich.
University of Chicago, Chicago, Ill.
Northwestern University, Evanston, Ill.
Purdue University, Lafayette, Ind.
University of Wisconsin, Madison, Wis.
Michigan State Normal, Ypsilanti, Mich.
State University of North Dakota, Grand Forks, N. Dak.
Lake Forest Academy, Lake Forest, Ill.
Lawrenceville School System, Lawrenceville, Ill.
Culver Military Academy, Culver, Ind.
Ball State Teachers' College, Muncie, Ind.
Sterling College, Sterling, Kan.
University of Michigan, Ann Arbor, Mich.
Blue Island High School, Blue Island, Ill.
Wheaton High School, Wheaton, Ill.
Washington High School, River Forest, Ill.
Muskegon High School, Muskegon, Mich.
St. Ambrose College, Davenport, Ia.
Nelsonville Public Schools, Nelsonville, Ohio
Municipal School Stadium, Sandusky, Ohio
Joliet Township High School, Joliet, Ill.
State Teachers College, Whitewater, Wis.
City Public Schools, Jackson, Ohio

East

Manlius High School, Manlius, N. Y.
University of Rochester, Rochester, N. Y.
Shepard State Teachers College, Shepardstown, W. Va.
Fosdick-Masten Park High School, Buffalo, N. Y.
Massachusetts Institute of Technology, Boston, Mass.

West

University of Southern California, Los Angeles, Cal.
University of Oklahoma, Norman, Okla.
Oregon State College, Corvallis, Ore.
Duncan Union High School, Duncan, Ariz.
Roosevelt School, Phoenix, Ariz.
Lone Pine Union High School, Lone Pine, Cal.

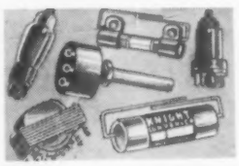
South

St. Augustine's College, Raleigh, N. C.
Annville Institute, Annville, Ky.
Vanderbilt University, Nashville, Tenn.
University of Virginia, Charlottesville, Va.
University of Louisville, Louisville, Ky.
South Side Catholic High School, St. Louis, Mo.
Berea College, Berea, Ky.
Columbia High School, Lake City, Fla.
Castle Heights Military Academy, Lebanon, Tenn.
U. S. Field Artillery School, Fort Sill, Okla.

IT PAYS TO CONSULT ALLIED FOR:

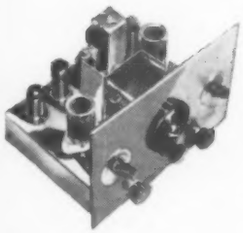
COMPLETE SOUND SYSTEMS
AMPLIFIERS
RECORDING EQUIPMENT
PHONOGRAPH EQUIPMENT
MICROPHONES
SPEAKERS
CENTRALIZED RADIO
RADIO RECEIVERS
RECORD CHANGERS

COMPLETE LINES OF RADIO EQUIPMENT FOR SCHOOL LABS AND CLASSES



PARTS AND KITS FOR RADIO CLASSES AND CLUBS

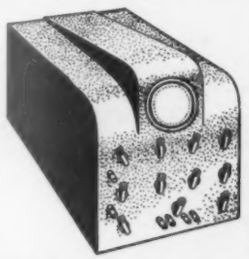
We offer school classes and clubs studying radio and electricity a very wide selection of radio-building kits. As Radio Parts Headquarters we can supply matched kits for building any type of circuit, as well as parts, tools, textbooks, etc. We will be glad to quote low prices for any type of radio equipment. Our Engineering Division is constantly at your service, ready to help with advice and technical information, without obligation.



FREE DIAGRAMS AND PARTS LISTS

We supply free complete parts lists for building all of the popular radio circuits described in the leading radio magazines and handbooks. We can also supply free wiring diagrams for all types of receivers, etc., and shall be glad to send quantities desired to radio instructors, classes and clubs upon request. Our complete catalog listing of radio books will be of interest to radio and electrical class instructors. Write for your free copy.

RADIO EQUIPMENT FOR THE LABORATORY



As Radio Supply Headquarters we serve many schools and institutions with high grade laboratory radio equipment. We feature a complete line of Oscillographs, dry and wet cell Batteries, Test Equipment, Vacuum Tube Voltmeters, Ohmmeters, Ammeters, etc., Converters, Generators, Photo-Cells, Relays—everything for the modern laboratory at the lowest prices. Fill your laboratory needs with tested, dependable, low cost equipment from ALLIED RADIO. Keep a copy of our current catalog on file—it is a valuable index to everything in Radio.

SPECIAL RADIO EQUIPMENT

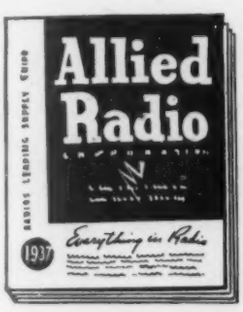
We are radio specialists and can secure for you any special type of laboratory radio equipment required for experimental or demonstration use. We are in constant touch with the leading radio manufacturers and are ready to pass on to you the benefits of the latest developments of their laboratories. Our Technical Staff has cooperated with eminent scientists in designing special equipment to be used in important radio, physical and electrical experiments. We urge you to consult us first for standard and special radio equipment.

OUR ENTIRE TECHNICAL STAFF IS AT THE SERVICE OF EVERY SCHOOL

The knowledge, experience, and cooperation of our entire Technical Staff is at your service without cost. Composed of Engineers and licensed Amateurs, our staff has had a wide range of experience in designing, constructing and recommending radio equipment for all types of academic projects. Scholastic and governmental agencies find in us a dependable source for quality radio supplies at the lowest wholesale prices. Write us your specifications; we shall be glad to aid you in selecting the equipment you need accurately, expertly, and economically. Wherever radio is concerned, we offer you valuable advice, swift service and budget-mindful prices.

WE INVITE YOU TO WRITE FOR OUR FREE CATALOG

We shall be glad to send copies of our catalog for your control files and for reference by interested departments. The most complete radio supply book ever published, it lists more than 10,000 exact duplicate and replacement parts for building or repairing practically any radio circuit; leading lines of laboratory and testing instruments; Public Address equipment for every standard need—8 to 60 watts—permanent, portable and mobile, for 110 volt, 6 volt and universal operation; complete lines of Amateur transmitting and receiving gear; all-wave and short-wave sets; set-builders' kits; tools, books, etc. It will pay you to keep a copy handy for ready reference.



S. H. COUCH COMPANY, INC.

Centralized Sound, Telephones, Fire Alarms and Program Signaling

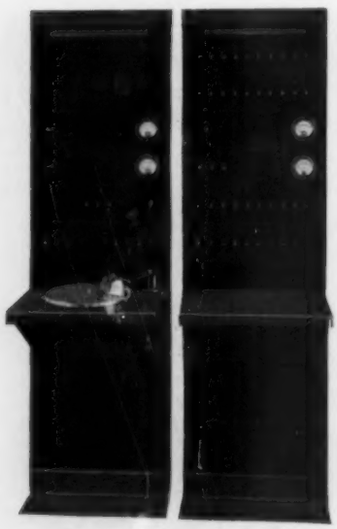
North Quincy, Mass.

"UNIFIED" SOUND, TELEPHONE AND SIGNAL SYSTEMS

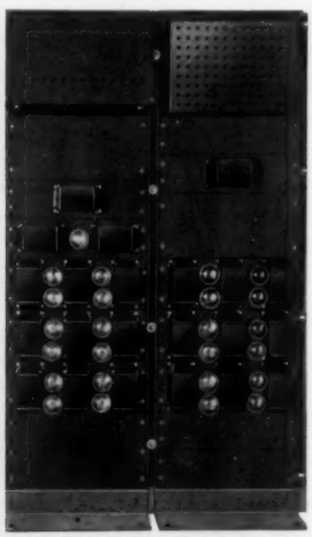
The unification of radio, telephone, program signaling and in some cases fire alarm signal systems, offers very definite advantages and economies which school boards, architects and building committees are quick to realize. Radio programs, time signals, fire alarm signals and complete telephone service—all can be operated over a three-wire circuit with tremendous economies in apparatus, conduits, wire, labor and maintenance, when compared with the older installations where each system is a separate entity.

The unified switchboard illustrated at the right provides telephone and sound system control for a school with fifty outlying telephones and speakers. This type of switchboard is recommended for any size system, but in the larger systems it is usually desirable to mount most of the amplifier equipment on a separate rack and panel assembly with remote control at the switchboard.

"Unified" Switchboard for school of 50 classrooms



Typical Rack and Panel assembly for school of about 40 classrooms. Note phonograph turntable and table for handling records



Centralized Sound Cabinet available for schools of any size. Equipment includes radio tuner, 2-speed turntable, "listening-in" feature, individual speaker control switches, and input and output controls, etc.

CENTRALIZED SOUND SYSTEMS

Control equipment is available either in Rack and Panel or Cabinet construction as illustrated. All modern features may be specified such as:

- Radio tuner, broadcast and all wave bands
- Phonograph turntable, one or two-speed
- One, two, three, or four channel systems
- "Listening-in" or classroom supervisory system
- Auditorium and gymnasium programs through the central amplifiers
- Automatic Time Signaling System over the classroom speakers

Couch equipment is manufactured to the highest standards and is the result of many years of specialized experience in the school communications field.

"Write for Bulletin No. 97"

A TELEPHONE SYSTEM SAVES TIME AND FOOTSTEPS

The three school telephone systems listed below cover the requirements of the large majority of schools.

Lamp Switchboard System No. 351 (selective ringing, selective talking) is recommended for schools having any number of substations from 40 or 50 up. Cross-connection between substations is provided by cross-connecting cord pairs at the switchboard. Standard equipment includes a lamp and jack for each line, operator's ringing and listening keys, power switch, night bell, and a silencing switch and operator's talking set which may be either breast-type transmitter and head set or suspended or cradle hand set. Cabinet work is of finest design and construction, and best quality materials used throughout. A selection of switchboards in wall, floor or desk types is available.

No. 49 Surface Classroom Phone

No. 48 Flush Classroom Phone

Master Station Systems Nos. B3B and B33B (selective ringing, common talking) are recommended for grade schools of any size up to 30 to 40 rooms. Communication is provided between master station and substations. Intercommunication between substations may be obtained by calling the master station. System B33B differs from B3B in that it has an annunciator which gives visual indication of the origin of each call at the master phone.

No. 71 Handset Classroom or Office Phone

No. 52 Flush Handset Phone

No. 53 Surface Handset Phone

No. 8A Desk Type Lamp Switchboard

Classroom Phones: The telephones illustrated are for use on the systems described on this page, also for the UNIFIED Systems mentioned on p. 352, equipped with or without button according to requirements of system. The phones are the result of many years of manufacturing experience and represent a distinct advance in design and quality.

Flush Break-Glass Fire Alarm Box

EVERY SCHOOL SHOULD BE EQUIPPED WITH A FIRE ALARM

S. H. Couch Company, Inc., offers apparatus for school fire alarm systems ranging from the simplest open circuit continuous ringing systems to the more elaborate closed circuit, double supervised, coded, pre-signal and city-connected systems. Complete catalog information is available and specifications will be prepared for architects and others interested.

Break-Glass Pull Lever Fire Alarm Box

Fire Alarm Systems may be specified with the conventional single stroke or vibrating gongs for fire signals, or the fire signals may be sounded through the loud speakers, thus eliminating the gongs and attendant wires, conduits, etc. In the latter case, a fire signal takes precedence on the system by automatically cutting out any and all programs that may be in progress. While the sounding of fire signals over the sound system is approved by the National Fire Prevention Association, a separate and distinct system of wiring and conduit for the fire alarm box circuits is required.

Underdome Type Fire Alarm Gong

Horns may be used in place of, or with gongs on Fire Alarm Systems

Master Station for System B3B

Write for Bulletin No. 97

DICTOGRAPH PRODUCTS COMPANY, INC.

580 Fifth Avenue, New York, N. Y.

Specializing in Aids to Better Hearing Since 1903

OFFICES IN

Boston Chicago Philadelphia Los Angeles San Francisco Toronto

AND OTHER CITIES THROUGHOUT THE WORLD

Manufacturers of

THE NEW AMPLIFIED SCHOOL ACOUSTICON

(For use in Instructing Congenitally Deaf and Hard of Hearing Children)

AND

THE BUCK ROGERS 25th CENTURY ACOUSTICON

THE NEW AMPLIFIED SCHOOL ACOUSTICON

The following statement is quoted from "Your Hearing" by Wendell C. Phillips, M.D., and Hugh Grant Rowell, M.D.:

"Fourteen percent, or about three million children of school age, have been shown, by the surveys of the American Federation of Organizations for the Hard of Hearing, to have detectable hearing defects, showing close to 30 percent impairment of hearing."

A moment's thought will show that these figures indicate the need of equipping at least one school seat out of every ten with a compensating device. But equipment for this purpose must be specially designed for pedagogic needs, must consider many factors in addition to the bringing of natural hearing to congenitally deaf and hard of hearing pupils.

The wide acceptance of Acousticon Group Hearing Equipment by educators, Parents' and Teachers' Associations and schools and colleges attests the peculiar qualifications of these installations for work of this kind. Acousticon is the favored equipment in the Kiwanis classes for the instruction of deaf-mutes. A completely flexible range of models permits adaptation to any school need. There are portable models to facilitate transportation from room to room; there are powerfully amplified systems; the receivers are available for bone or air conduction and there is no audible click when they are plugged in or disconnected. Nothing about the equipment intrudes on the attention of the class as a whole when pupils with normal hearing are present—and the instructor rapidly becomes so accustomed to the noiseless, non-resonant microphone that he forgets its presence.

THE AMERICAN SCHOOL AND UNIVERSITY

14% OF YOUR PUPILS ARE DEAF
30% ARE HARD OF HEARING

Acousticon invites inquiries, particularly with reference to speech and hard of hearing classes—and will gladly furnish further information or cooperate in the development of a system designed specifically for your needs.

BUCK ROGERS 25th CENTURY ACOUSTICON

This personal, portable Acousticon aid to better hearing is designed to appeal to children and enlist their enthusiastic cooperation. Despite its small size and feather-light weight, it is an extremely sturdy and efficient instrument—with great range and pick-up power. No head-band is required, the tiny ear-piece resting comfortably and securely in place throughout even rough play. Records show that it is an essential accessory for the deafened child—permitting normal relationships with other children and protecting against the many psychological dangers that attend childhood deafness. Literature gladly sent on request.

Acousticons are now scientifically custom fitted like eyeglasses with the Auragage, Science's latest development

Children Love It Because It's "AS WORN BY BUCK ROGERS"

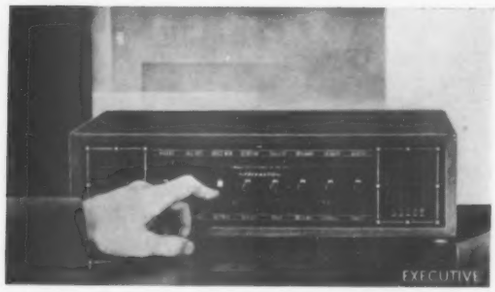
DICTOGRAPH PRODUCTS CO., INC.

580 Fifth Avenue, New York, N. Y.

OFFICES IN: Boston, Chicago, Philadelphia, Los Angeles, San Francisco, Toronto, Can.
AND OTHER PRINCIPAL CITIES OF UNITED STATES AND THE WORLD

Manufacturers of
Dictograph Inter-Communicating Telephone Systems
and
The Dictograph Dialphone

For Instant, Flip-Finger Voice Contact with Your Associates and Assistants!



DICTOGRAPH INTER-COMMUNICATING TELEPHONE SYSTEMS

The increased complexity of modern curricular activities makes it imperative that the administration offices of today's schools and colleges have quick, direct access to information. For this purpose the Dictograph Inter-Communicating Telephone System is suggested—a product now in operation in many of America's institutions of learning.

Dictograph systems have many advantages that make them unusually suitable for school use. There is no wasted time or motion—a flip of the finger and the connection is completed.

The speaker has immediate access to information from any part of the organization while talking on the telephone, dictating letters, making decisions, conducting meetings or interviewing callers. The Dictograph Inter-Communicating Telephone System greatly facilitates issuing instructions and disposing of work. Strict privacy is assured for confidential communications—and the tempo of the entire organization is speeded up, while faculty and staff "rumors" are reduced to a minimum.

The system consists of any number of Executive and Staff Stations, dependent upon requirements. On the Executive Station contact is obtained by the flick of a key. A sensitive microphone picks up the speaker's voice. (A separate hand set is provided to silence loud speaker without interrupting talk when privacy is required.) Name plates identify connections, a white signal labels incoming calls and special signals on staff stations give Executive calls right-of-way and leave automatic memorandum of call if party is not present.

The Staff Stations are for general service and have direct key contact. Calls are announced by a soft-toned buzzer, and are answered by merely picking up the handset and talking.

Dictograph Inter-Communicating Systems are flexible and selective—adaptable for small as well as large organizations. All Dictograph Products are guaranteed for a period of 10 years.

Complete details and literature will be mailed on request—or we will be glad to survey your communicating facilities to determine the specific advantages these systems can offer your organization.

THE DICTOGRAPH DIALPHONE

Organizations not requiring loud-speaking communication and certain other refinements offered by the Dictograph Inter-Communicating Telephone System will find the Dictograph Dialphone an economical and efficient means of establishing contact among staff members. These systems employ the conventional handset principle and contact between stations is made by both key and dial. The Dictograph Dialphone is also an extremely flexible system, adaptable to the needs of large and small organizations. Literature on request.

GENERAL ELECTRIC COMPANY

General Office: Schenectady, New York

SALES OFFICES IN PRINCIPAL CITIES

CLASSROOM EYESTRAIN—ITS HEAVY COST

The up-to-date school executive or teacher is becoming increasingly eye-conscious. He is beginning to realize the heavy cost of eyestrain in the classroom. More and more he is appreciating the truth of these facts:

"The sense of sight is by far the most important medium by which pupils learn. In studying, a pupil's eyes take countless visual impressions or images. If the lighting and visual conditions are such that these images are taken rapidly and clearly, a lesson will be learned more quickly, and with less drain upon the child's resources.

"The direct result of this preventable backwardness is an economic waste, both through loss of the pupil's time, with the inevitable discouragement which follows failure, and through the additional expense to the school system.

"When through impaired vision students are deprived of the opportunity to acquire information that would be of use and value to them, or are compelled to spend additional months or years in school in order to repeat work in which they have failed, the individual, the community, and society in general suffer a heavy loss."

The above quotations are from "Standards of School Lighting, with Suggested Requirements for a School Lighting Code," a pamphlet prepared under the joint sponsorship of the Illuminated Engineering Society and the American Institute of Architects which should be in the hands of every school executive and school architect.

G-E Photoelectric Relay, CR7505-D5
For Indoor Light Control

WHAT ARE SCHOOLS DOING TO PREVENT AVOIDABLE EYESTRAIN?

Two main factors are responsible for classroom eyestrain:

1. *Faulty vision.*
2. *Faulty lighting.*

A great majority of the schools in this country are making more or less adequate provision for examining the eyes of the pupils and prescribing glasses, where necessary, to correct faults of vision. But the matter of proper school lighting has been left largely to chance. True, windows have been provided, there has been some attempt to avoid glare by providing window shades, and usually pupils have been seated so as not to face the light. But very little expert attention has been given to providing the correct amount of light, properly diffused and distributed. Certain types of school activities require higher degrees of illumination than certain other types.

GENERAL ELECTRIC PHOTOELECTRIC RELAYS INSURE CORRECT SCHOOLROOM LIGHTING AT ALL TIMES

Guesswork Eliminated—General Electric Photoelectric Relays

How may a teacher know that the pupils are receiving the proper amount of light at any given time? There are two ways that can be depended upon:

1. *A photoelectric relay may be used to warn the teacher at the moment the natural illumination becomes insufficient.*
2. *Better yet, a General Electric Photoelectric Relay will actually turn the artificial light on or off, at the foot candle levels selected, thus using the artificial light when needed.*

Is this General Electric Photoelectric Relay expensive? On the contrary, it is inexpensive, compared with the cost of poor illumination and impaired vision!

Then why are not these General Electric Photoelectric Relays in general use in the schools all over the country? Of course, the answer to this is that the idea is a comparatively new one. But just as electric refrigeration and air conditioning have advanced, and will continue to advance, so this other scientific invention for adding to the pupils' welfare and efficiency has been advancing in this year 1937, and will continue to advance in the years to come.

Write for Information on General Electric Photoelectric Relays

To those school executives or school architects who would be interested in the technical details of G-E Photoelectric Relays, we shall be glad to send a copy of our Booklet GEA-1654B, showing the general line of photoelectric relays. Or a G-E representative will be glad to discuss classroom requirements with you, advising the proper type to meet your needs.

GENERAL ELECTRIC COMPANY

Nela Park, Cleveland, Ohio

How better light aids young eyes

● More and more educators are coming to realize that proper classroom lighting can have a real effect upon grades and physical health. Many a child labeled "nervous," "difficult," or "backward," is simply a normal child tormented by the strain of reading or studying under inadequate light.

Children's eyes should be examined regularly by a competent eyesight specialist. Schoolroom lighting should be **measured** to be sure it is up to modern standards. A G-E Light Meter, a sensitive device which measures light as a thermometer measures temperature, should be a part of every school's equipment. With its help you can determine the amount of light present, and the light needed in every room. And you will discover, as many schools have, that the slight additional cost of aiding youthful eyes with better light is a sound investment that will bring about fewer failures, better marks, better classroom morale, and improved physical and mental health. Write for free illustrated 20-page booklet, "New Knowledge of Seeing in the Classroom." Dept. 166, General Electric Co., Nela Park, Cleveland, Ohio.

MEASURE LIGHT EASILY WITH A G-E LIGHT METER

Every school should have one. A Light Meter measures light in "footcandles" just as a thermometer measures temperature in degrees Fahrenheit or Centigrade. The face of the meter is clearly marked for different types of seeing jobs. For instance a glance shows whether the amount of light falling on a book is correct for reading.

No guessing here! The Light Meter enables you to know positively whether or not children are getting sufficient light to avoid eyestrain

DO-2127

RCA MANUFACTURING COMPANY, INC.

Camden, New Jersey

A Service of the Radio Corporation of America

COMPLETE SOUND SERVICE FOR SCHOOLS

THE increasing importance of sound in educational work, especially in colleges and high schools, has resulted in increased activity by the large RCA Research staff at Radio Headquarters. Much time and effort have been devoted to the solution of school sound problems. Discoveries brought to light in the research laboratories are used by RCA engineers to design and develop equipment to meet the particular requirements of schools. The RCA sound equipment and materials resulting from this extensive research and careful planning are now available—the finest that can be produced for schools.

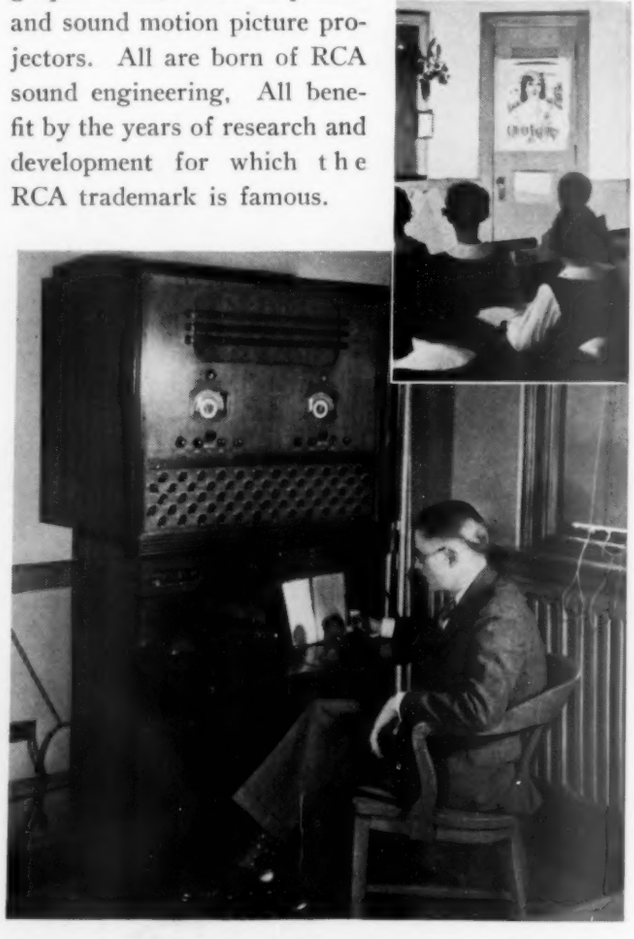
RCA's Centralized Sound System is a fitting example of the equipment designed to meet the problems of the schools. This system makes it possible to bring to any or every classroom the choice of a wide range of programs offered daily by the radio—Music Appreciation, Geography, History, Literature, Current Events, Domestic Science, and many others in which educators and pupils are vitally interested.

RCA's Centralized Sound System enables the entire school or any part of it to be reached by record programs, speeches, announcements, or any other type of program the principal or superintendent may consider desirable. The system is unusually effective in fire drills—safety programs, health, first aid, and other activities of all students.

The control system of this equipment is housed in a beautiful walnut cabinet which is illustrated on this page. Adaptable to any situation, it includes two RCA Victor Magic Brain, Magic Eye, Metal Tube Radios, two Monitor Loud Speakers, Controls for volume, tone, and wave bands, Station selector, an individual Control Switch for each classroom, an automatic two-speed phonograph, high gain amplifiers, and provision for the famous RCA Velocity microphone.

Schools which are interested only in the radio section of an RCA Victor School Sound System can obtain a single radio section. This will provide for radio programs to any or all rooms for announcements through a double-button microphone. Similarly, the phonograph and announcement section is available as a separate unit, containing an automatic or manually operated phonograph and providing for a microphone to suit local operating conditions. The equipment can be adapted to the requirements of any school, large or small.

The RCA Centralized Sound System is but one of a complete series of sound equipments for schools. With modern education rapidly and consistently joining the trend to "Lessons that live," the RCA Manufacturing Company produces a comprehensive assortment of sound educational equipment including phonograph records, record cabinets, Victrolas, Electrolas, phonograph-radios, sound amplifiers and sound motion picture projectors. All are born of RCA sound engineering. All benefit by the years of research and development for which the RCA trademark is famous.



Panel or Control Unit of RCA Centralized Sound System

RCA MANUFACTURING COMPANY, INC.

Camden, New Jersey

A Service of the Radio Corporation of America

COMPLETE SOUND SERVICE FOR SCHOOLS

It is not possible to illustrate everything RCA manufactures for schools on these pages. The Model R-99, RCA Victor Electrola shown here ranks as the finest instrument made for playing Higher Fidelity Victor Records. This all-electric instrument is operated by seven tubes and among its features are the dynamic amplifier, high frequency tone diffuser, spring balanced tone arm, automatic record stop. Besides this model there are other portable Electrolas and Victrolas of high quality for school use.

School after school is going modern with RCA Victor phonograph-radios. Model 9-U-2 is the last word in the combination phonograph and radio for school and home use. It receives radio programs or reproduces phonograph records with amazing fidelity. It may be used at low volume in a classroom of moderate size where it will reproduce each note with softness and accuracy. Or, it has sufficient volume to reach the far corners of the school auditorium with equal fidelity of tone. Outstanding among its radio features are the Magic Voice, Magic Brain, Magic Eye and Metal Tubes. Its wide tuning range—150-410 to 530-60,000 kilocycles—covers domestic broadcasts and all short waves. It has the selector dial, band spreader, 2 speed tuning, 12″ dynamic speaker, music-speech control and several other performance features. The phonograph has an automatic record changer, and automatic stop.

Other RCA Victor radios, Victrolas, Electrolas, combination instruments, projectors for sound films, portable amplifiers, Victor records for schools, and books explaining the educational use of recorded sound are listed in the new educational catalog "Sound Service for Schools," which will be mailed to any school executive or teacher on request. There is no charge for this book and you are under no obligation. Simply write to the Educational Department, RCA Manufacturing Company, Camden, New Jersey, for your copy.

Model R-99 RCA Victor Electrola

RCA Victor Combination Phonograph Radio Model 9-U-2

WESTERN ELECTRIC COMPANY

New York, N. Y.

Distributor in the United States
GRAYBAR ELECTRIC COMPANY
Graybar Building, New York, N. Y.
Distributor for Canada and Newfoundland
NORTHERN ELECTRIC COMPANY, LIMITED
General Offices and Plant: 1261 Shearer Street, Montreal, P. Q.

Western Electric

SYSTEMS FOR AMPLIFYING AND DISTRIBUTING SOUND

General

Western Electric equipment picks up, amplifies and distributes speech or music to all parts of an auditorium—to any or all rooms in a building—or to a number of points out of doors. The source of the program may be (1) Microphones, (2) Record Reproducer, (3) Radio Receiver.

Developed by Bell Telephone Laboratories for the Western Electric Company, these systems assure high quality sound reproduction and utmost dependability.

Many up-to-date schools, colleges and universities in **all parts** of the country have found Western Electric sound distributing systems valuable—for both educational and administrative uses.

Description

While each installation is carefully planned to meet specific requirements, the new low cost unit illustrated is adequate for all but very large installations. In one compact cabinet it contains a combination microphone and monitoring loud speaker—a record reproducer—a radio receiver—amplifiers—and keys for selecting loud speakers in as many as 60 locations.

So that two programs may be reproduced simultaneously in different rooms, **two** amplifiers may be provided. If it will never be necessary to reproduce more than **one** program at a time, the second amplifier may be omitted.

A new and valuable feature is the "talk-back" circuit which enables the school principal to carry on a two-way conversation with any room.

Microphone Circuits. There are three circuits which may be used for microphones in various locations. The Western Electric non-directional dynamic microphone—which picks up equally well from all directions—is especially recommended for use on platforms and for picking up the music of an orchestra.

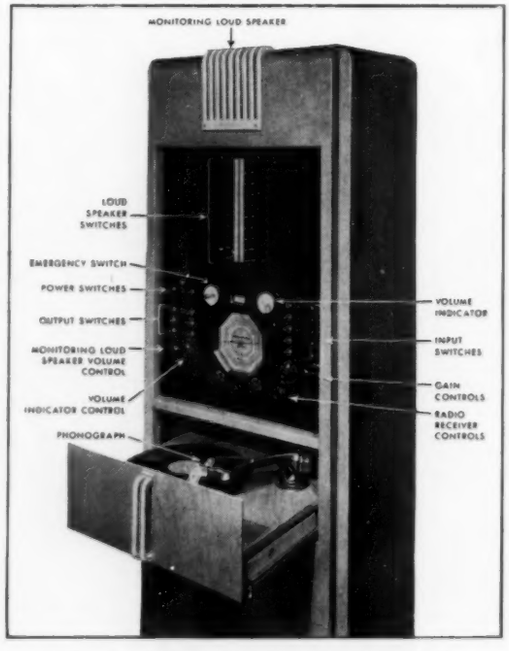
Radio Receiver. An all-wave high fidelity receiver which brings in programs from domestic or foreign stations.

Record Reproducer. A two-speed phonograph turntable which plays all standard, laterally cut records.

Cost and Service

In estimating the cost of installation, specific requirements must be considered. Graybar Electric Company engineers will gladly survey your buildings, recommend a system for adequate coverage, furnish complete specifications and an estimate of cost.

Stocks of spare parts are maintained at strategic points.



Control Panel of Program Sound System

Uses in Schools

Sound distributing equipment is useful all around the clock—yet costs only a few cents an hour to operate.

It brings to the classroom the words of noted educators; is a valuable aid to teachers of languages, current events, music appreciation and other courses. It enables the principal to address all classrooms from his desk; delivers fire drill instructions and emergency announcements instantly; supplies music or voice amplification in gymnasium or auditorium.

For full information, write to distributors listed at top of preceding page.

• • •

WESTERN ELECTRIC AUDIOMETERS

Hearing of as Many as 40 Pupils May be Tested at One Time

Poor hearing is often the cause of poor classwork. With the Western Electric 4A Audiometer, pupils' hearing acuity may be measured quickly and accurately.

This scientific instrument consists of a turntable with magnetic reproducer—and from 8 to 40 headsets through which pupils listen. It plays special records which are designed to show degree of hearing loss. Pupils write what they hear on data sheets. By checking these against a master sheet, even slight hearing defects are seen at a glance.

Ask the distributors for new Bulletin giving full information.

• • •

WESTERN ELECTRIC AUDIPHONES

Air Conduction Type

Bone Conduction Type

For the hard-of-hearing, Western Electric makes individual Audiphones using either air conduction or bone conduction receivers. These are available in varying models, with or without amplifiers, to meet specific needs.

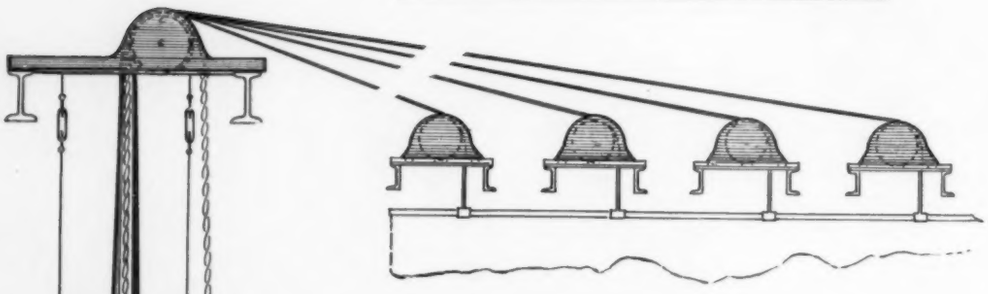
There is also the Western Electric Group Audiphone. With this equipment, the speaker's words are picked up by a microphone, are amplified, and delivered through light, individual headsets.

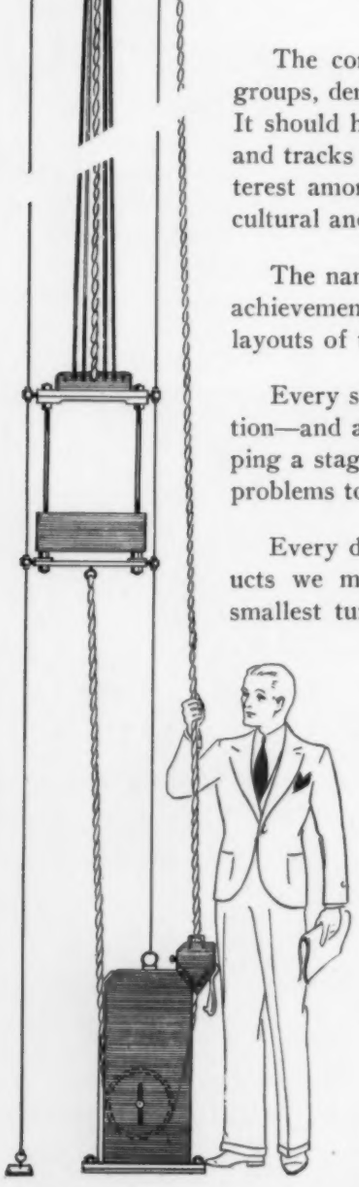
Further details from the distributors listed on preceding page.

J. R. CLANCY, INC.

Stage Rigging and Equipment
For School or College Auditorium Stage

Syracuse, N. Y.





The constantly growing interest in dramatic art, in schools, colleges and church groups, demands that the auditorium stage be built for the future and not for the past. It should have complete but absolutely safe, simple and practical rigging, curtain hoists and tracks as well as the necessary items of hardware. Such a stage will encourage interest among students and promote community dramatic societies, concerts and other cultural and social activities.

The name CLANCY for one half century has been associated with the outstanding achievements in stage equipment and modern devices. Our organization has planned the layouts of the world's largest as well as the smallest theatre and playhouse stages.

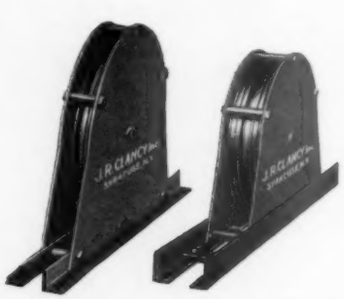
Every stage should be designed with a view to flexibility, simplicity, perfect operation—and above all—absolute safety. The CLANCY method of planning and equipping a stage incorporates all of these features. Our fifty years' experience has shown us problems to be met and taught us how to solve them efficiently and economically.

Every device required for the modern stage is available in the complete line of products we manufacture—from the largest curtain block or draw-curtain track, to the smallest turnbuckle.

Our engineering staff is ready and willing to give advice and suggestions to school, college or church executives, architects, builders and contractors—without obligation. Our half century of experience is at your service. Write for any information that you may desire.

COMPLETE CATALOG

Write for our complete catalog of stage equipment. It will be sent free on request.



Showing a CLANCY Steel Frame
Loft Block and Head Block

DESKOR CHAIR SALES CORPORATION

Park Square Building, Boston, Massachusetts

DESKOR

(PATENTED)

MULTIPLE USE CONVERTIBLE SCHOOL SEATING SYSTEM

will in a new school building reduce the cost as much as 33%; in an old building it will increase the capacity as much as 20%.

WHAT DESKOR is:

The Deskor unit consists of two separate parts: **1. a stationary chair; 2. a removable converter,** which is utilized as a **desk** when placed in the runways at the back of the stationary chair, or as an **extra seat** when placed between two stationary chairs.

With DESKOR—

A classroom can instantly be converted to seat twice as many pupils, with no desks.

An auditorium can be converted instantly into a study hall with desks in classroom formation; and a study hall can be converted instantly into an auditorium seating twice as many, without desks. **The pupils make the change in less than one minute.**

Two or more rooms can be thrown into one by means of folding partitions, thus providing an auditorium.

Practical, flexible, sturdy, comfortable, attractive—DESKOR is adaptable to any size of room.

Deskor's new floor plate permits the removal of the chairs whenever it is desirable to have a clear floor.

110 DESKOR units saved Concord, New Hampshire, $40,000 of the cost of a new elementary school building, the original estimate being $120,000. We shall be very glad to send to you upon request a brochure which tells in detail how this result was accomplished.

Complete specifications and descriptions of other DESKOR installations are given in an illustrated circular entitled "DESKOR," a copy of which will be sent to you upon request.

If you are planning a new building

BUILD THE DESKOR WAY

or increase the capacity of an existing building by installing DESKOR CHAIRS

DICTAPHONE SALES CORPORATION

EDUCATIONAL DIVISION

420 Lexington Ave., N. Y. C.

Three Courses

That Follow
The Modern Trend To

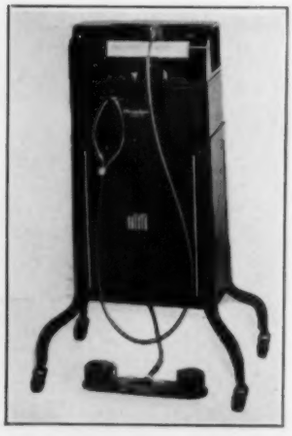
DICTAPHONE

1. DICTAPHONE BUSINESS PRACTICE

New material, new exercises, new records, by Ivy Monk, Head of Typewriting and Office Training Dept., Drexel Institute. Gives the equivalent of 50 hours' practical office experience.

2. DIRECT DICTATION TYPEWRITING

Where the use of the Dictaphone, accurately correlated with the textbook, shows a saving of 33⅓% in time—and still increases results 25%.



3. ACCEPTABLE AMERICAN SPEECH

By Mrs. Letitia Raubicheck, Director of Speech Improvement, N. Y. City Board of Education, and Mrs. Mary Morris Seals, Barnard College, Columbia University. Aided by 20 full sized permanent practice records, this course is the Ultima Thule of Improved Speech.

These three courses are used with the new B-12 Dictaphone Transcribing Machine, equipped with "Nuphonic Reproduction," which sets a new standard for voice clarity.

Write us today for complete information

DITTO, *Incorporated*

World's Largest Manufacturers of Gelatine and Liquid Duplicators

2205 W. Harrison Street, Chicago, Ill.

II

For Gelatine or Liquid Process Duplicators—

LOOK TO DITTO

For years Ditto, Incorporated, has been the world's largest manufacturer of gelatine duplicating machines and supplies. Always its aim has been to manufacture and sell equipment that will do the job which you have to do at the lowest possible cost.

Today, Ditto manufactures and sells both **Gelatine** and **Liquid** type duplicators—providing a complete selection for every school use at prices ranging from $3.95 up. You can make no better selection anywhere than from the complete line of Ditto School Duplicators.

An important fact to remember is that there are advantages to both **Liquid** and **Gelatine** type duplicators. Because Ditto manufactures and sells both types of machines, Ditto representatives are in a position to make intelligent, unbiased recommendations as to the machine that will serve your purpose best.

The Gelatine Duplicator is famous for its flexibility. It copies one or all of eight colors in one operation direct from your pencil, pen and ink, typewriter or printed original; it needs no stencil, carbon or type. One original will produce 100 copies.

The Ditto Direct Process (liquid) Duplicator supplements and extends the Ditto process in two important respects:

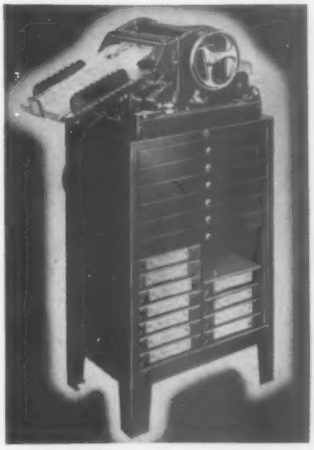
(1) It extends the Ditto copy range from 100 to 200 copies, still maintaining the low operating cost so typical of all Ditto equipment.

(2) It makes possible the repeated use of an original to make additional copies of the information as needed. The copies are made by direct offset from the original.

Any elementary grade child can operate Ditto. That's why it has been such a favorite with teachers: that's why you will find in thousands of schools today that all duplicating work is done by Ditto.

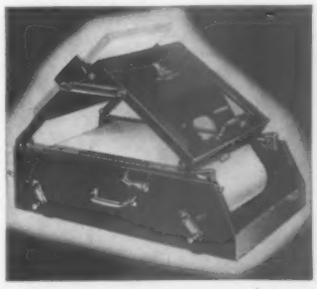
Write today for a free demonstration of either a Ditto Gelatine or Liquid Duplicator, or more detailed information about either type of duplicating method.

GELATINE DUPLICATORS



Ditto Electric Rotary—Fastest gelatine duplicator—self-feeding, self-ejecting. Simply press the button to deliver copies. Size 8½ x 14″

Hand Fed Rotary — Strong, lightweight, foolproof. Makes 50 to 70 copies per minute. Highly efficient—low in cost. Size 9 x 12½″

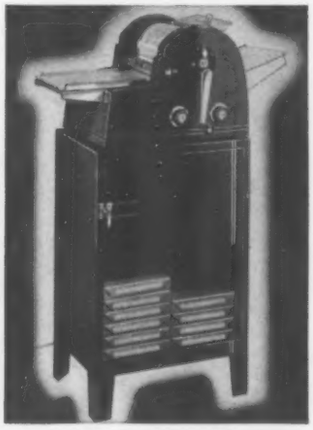


Portable — Low priced, hand operated, compact and flexible. Easily portable—low in initial cost and low in operating cost. Size 8½ x 13″

Film-o-graph—A teacher's duplicator. Replaces old-fashioned hectograph. Films are used over and over again. Size 8½ x 14″

LIQUID PROCESS DUPLICATORS

The Ditto D5—A table model liquid duplicator designed for school use. Contains many outstanding engineering features. Size 9 x 13¾″



The Ditto D4 — Electrically operated liquid duplicator. Fast and positive in operation. More speed—less fatigue. Two sizes, 9 x 17″ and 14 x 17″

EAGLE LOCK CO.

Terryville, Conn.

General Sales Office: 26 Warren Street, New York, N. Y.

BRANCH OFFICES

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Philadelphia, Pa.

179 No. Franklin Street
Chicago, Ill.

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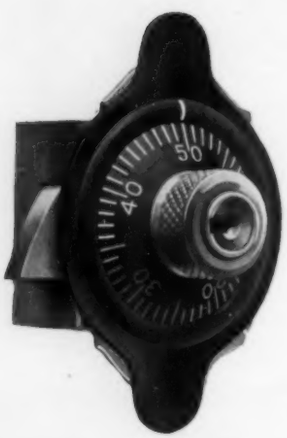
Boston, Mass.

COMBINATION LOCKS

The maximum of economy and security.



Automatic Locking — Furnished either masterkeyed or not masterkeyed

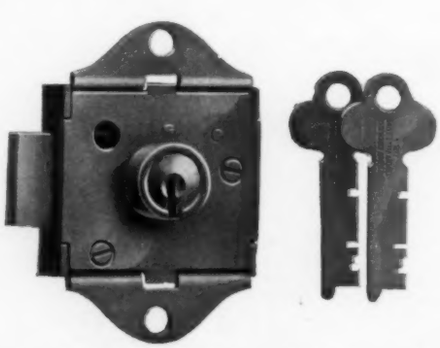
Automatic Locking — Furnished either masterkeyed or not masterkeyed

Automatic Locking — Not furnished masterkeyed

MANUALLY OPERATED KEY LOCKS

For use where greatest efficiency is requisite.

Pin Tumbler Construction—The type of work used in the most excellent grades of locks



Secure Lever Construction—A type of lock work that has proved its worth in years of service

Even under difficult space and light conditions the simple and positive operation of inserting and turning a key reduces delay to a minimum.

THE AMERICAN SCHOOL AND UNIVERSITY

THOMAS A. EDISON, INC.

Laboratory and General Offices: West Orange, N. J.

Principals, Superintendents, School Officials—

DISCOVER WHY YOUR PUPILS SHOULD KNOW EDIPHONE VOICE WRITING to succeed in business!

SAMPLE IT IN YOUR OWN OFFICE WORK

SAMPLE IT IN YOUR CLASS WORK

Absolutely no obligation under "YOU-PAY-NOTHING" PLAN!

You know that the Ediphone is becoming increasingly important in the business world. You know that ability to "Voice-Write" gives an applicant a big edge in landing a job.

Perhaps **you** have wanted to try using an Ediphone, but have never "gotten around to it." Here is your opportunity to use it—to test it—FREE—not only in classrooms **but in your office as well!**

Try it in the classrooms and note how eagerly your pupils take to the Ediphone. And see how the Ediphone helps **you** speed through your routine duties—how its convenience, its adaptability, actually engender enthusiasm and inspiration.

After using an Ediphone, you'll understand why executives depend so completely on this time-and-effort-saving instrument . . . why secretaries declare that Voice Writing eases their work.

Pro-technic **Ediphone**

Write for details of the New Edison "You - Pay - Nothing" Plan! An Ediphone is waiting for you — right now. Address Desk A 12, Department of Educational Training, Ediphone Division—

Thomas A Edison
INCORPORATED
ORANGE, N.J. U.S.A.

ELECTRO-ACOUSTIC PRODUCTS CO.

SUBSIDIARY OF THE MAGNAVOX COMPANY

Fort Wayne, Indiana, U. S. A.

The Concerto—Table Model

MAGNAVOX "CONCERTO" ELECTRIC PHONOGRAPH
For Use in Educational Institutions

The Magnavox Concerto is a new compact electric phonograph especially designed to reproduce the latest type, high fidelity phonograph recordings with all the beauty of tone and expression of the artist's original rendition. It is the only moderately priced instrument which really does justice to these fine recordings — with tone quality and volume formerly obtainable only in the largest and most expensive consoles.

It is ideal for educational use.*

* Music Appreciation
* English Instruction
* Language Teaching
* Gymnasium Instruction
* Typing Classes
* Recreational Uses

Sold through leading music and department stores from coast to coast. If your local dealer cannot supply you, write us for full particulars.

CENTRALIZED RADIO AND PUBLIC ADDRESS SYSTEMS

The latest developments in centralized radio and public address systems are now available for use in small, medium or large educational buildings at costs well within the means of the average school. A system of this sort may be purchased gradually, with a skeleton installation at first, which may be later enlarged to cover more of the school activities. Electro-Acoustic centralized systems are designed and built to insure perfect reproduction, ease of operation, freedom from maintenance problems and greater flexibility in use.

Such schools as Ann Arbor, Michigan, High School; Ramsey Junior High School, Minneapolis; Walnut Hills High School, Cincinnati; Lorain Ohio High School and many others are enjoying exceptional success in teaching and school administration through the use of this fine equipment. A highly trained engineering staff is at your service for the preparation of surveys, estimates and specifications without obligation to purchase.

THE LIBRARIAN—RECORD CABINET

The Librarian

The Magnavox Librarian is a beautiful walnut cabinet which not only serves as a library for your records but also provides a convenient stand for the Concerto. It is attractive whether used with the Concerto or alone. It is well proportioned — 28 inches high, 21 inches wide and 15 inches deep. A convenient needle tray is provided. It will accommodate a goodly number of ten inch and twelve inch record albums and also includes abundant space for records not filed in books. The interior is roomy and convenient. See illustration.

AUDITORIUM SOUND SYSTEMS

The use and enjoyment of your auditorium will be increased manyfold by the installation of a modern Electro-Acoustic Sound Reinforcing System. Everyone within the auditorium will hear and distinctly understand each word spoken from the stage. Commencement exercises, student plays and musicales—every type of auditorium activity, takes on new interest and usefulness when those participating make themselves heard easily and without distortion or mechanical effect. An auditorium system may also be purchased gradually, first installing only the amplifier, loud speakers and a microphone. Radio, phonograph and full stage pickup equipment may be added later. Choose Electro-Acoustic Equipment to be sure of the latest scientific developments in sound reproduction. Write for bulletins and for particulars of the 1937 Electro-Acoustic Stage Reinforcing Systems.

ELECTRO-ACOUSTIC PRODUCTS COMPANY

Subsidiary of The Magnavox Company

FORT WAYNE, INDIANA

Electro-Acoustic Equipment is Fully Licensed

THE GREGG PUBLISHING COMPANY

New York Chicago San Francisco Boston Toronto London Sydney

A Complete Office Practice Program

Practical Instructional Materials For Every Teaching Plan

For the Rotation Plan

OFFICE APPLIANCE EXERCISES, by J. T. A. Ely and A. C. Beaver

Revised November 1, 1935. The purpose of this brief course is to familiarize the students with the most commonly used office machines which, from the teaching standpoint, may be divided into four groups: (1) accounting and record-keeping machines, (2) duplicating machines, (3) name- and data-writing machines, (4) miscellaneous labor-saving machines.

The teaching plan of this beginning text is simple and is based on the apprentice system of instruction. One pupil at a time receives instruction on each type of office machine. He, in turn, "breaks in" the next pupil before passing on to another machine. This plan of instruction follows the customary procedure in the business office—the expert operator "breaking in" the new operator. List price of text, $1.60.

For the Battery Plan

OFFICE MACHINE PRACTICE, by Dr. C. H. Katenkamp

A series of five booklets designed to teach fundamental operation technique. A separate book for each machine. Largely self-instructing. The booklets include: No. 1, The Monroe Calculating Machine; No. 2, The Burroughs Calculator; No. 3, The Sundstrand Adding and Listing Machine; No. 4, The Dalton Adding Machine; No. 5, The Comptometer. List price of each booklet, 32¢.

APPLIED MACHINE CALCULATION, by George B. Kingsbury and Marjorie Smith

Adapted for use with any type of calculating or adding machine—either listing or non-listing. Twenty lessons, frequent tests, and plenty of supplementary work. List price of text, 60¢; package of checks, 36¢.

For the Integrated Laboratory Plan

OFFICE PRACTICE—AN INTEGRATED LABORATORY PROJECT, by Rose A. Scholl, Albert Stern, and Dr. Edward J. McNamara

The nearest approach to actual office procedure, and the most authoritative business practice course yet published for this plan of instruction.

This course presupposes a general knowledge of the functions of a business office and a reasonable amount of proficiency in the performance of various office skills. "Office Practice" calls for the functioning of these knowledges and skills in their natural relationship.

A finishing course for secondary school students, adapted to any and all types of office machines. May be used with or without equipment. Text in two parts. List price of each part, 80¢.

APPLIED SECRETARIAL PRACTICE, by Rupert P. SoRelle and John Robert Gregg

A comprehensive course for beginners. The office-manual approach and treatment for learning secretarial practice. This is the method usually followed by large offices in teaching new employees. The Laboratory Materials, projects taken from business offices, present an attractive integration of the various duties of the office. This course represents a minimum of theory and a maximum of office experience. Used by thousands of schools—of all types—as the text for secretarial practice classes. List price of text, $1.40; Laboratory Materials, 60¢.

Write our nearest office for sample copies.

GREGG BOOKS ARE AUTHORITATIVE

THE AMERICAN SCHOOL AND UNIVERSITY

HOFF RUBBER STAMP COMPANY

224 South Fourth Street
Minneapolis, Minn.

E. R. Spaulding.

HOFCO Etched Brass Plates for Schools and Colleges

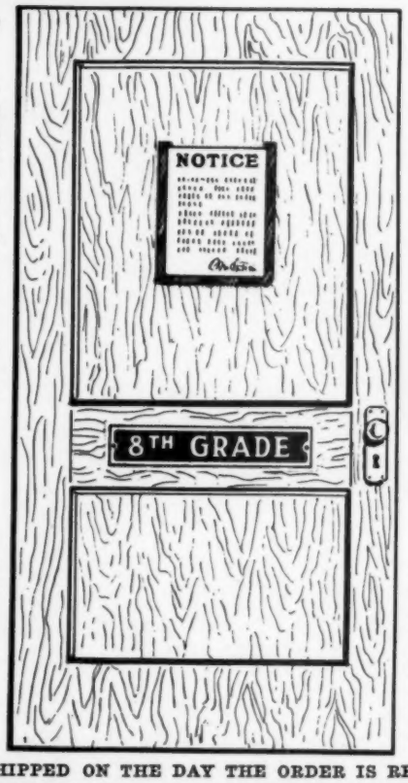
The great need in most school and college buildings for means of identifying the various classrooms, offices and departments is met most effectively and economically by the HOFCO line of room numbers and department plates. Made of heavy brass with brass numerals or letters standing out in bold relief against a deeply etched, jet black background, these Brass Plates present a handsome appearance not affected by time or exposure. (See Room Identification Plate on door at right.)

Plates are furnished for any numeral from 1 to 1,000; price 20¢ each. Room identification and other plates in all the wordings shown below are kept in stock for prompt shipment. 60¢ each; 6 to 11, 50¢; 12 or more, 45¢ each.

HOFCO Program Card Holders

These neat holders, nicely made of high-grade metal and finished in black, are very convenient and useful for posting announcements, programs, etc. Prices: 3 x 5″, 25¢ each, $2.50 dozen; 4 x 7″, 30¢, $3.00 per dozen; 5 x 8″, 35¢, $3.50 dozen. (See Program Holder on door at right.)

Sheets of celluloid for covering cards furnished at an extra charge of 3¢ each for 3 x 5″ size and 5¢ each for the 4 x 7″ size.



HOFCO Rubber Stamps and Stamp Pads and Stamp Ink

The HOFCO Rubber Stamp is the most modern type of stamp mount with convenient handle and a reproduction of the impression nicely printed under a celluloid strip. The "Viking" Pad is the best medium-priced pad made; furnished in violet, red, black, green or blue ink. Prices: Pad size No. 1 (2¾″ x 4½″), 35¢; doz., $3.75; 1 oz. bottle stamp ink, 35¢, doz., $3.50.

ALL PLATES SHOWN BELOW CAN BE SHIPPED ON THE DAY THE ORDER IS RECEIVED

1st GRADE	BATH	DEAN	GIRLS' REST ROOM	MEN	PRESIDENT	SMOKING →
2nd GRADE	BATTERY ROOM	Deliver All Goods in Rear	GIRLS' SHOWER	MEN TEACHERS	PRINCIPAL	← SMOKING
3rd GRADE	BEWARE OF DOG	DELIVERY ROOM	GYMNASIUM	MEDICINE	PROCURATOR	SUPERINTENDENT
4th GRADE	BIOLOGY	DIET KITCHEN	HEAD NURSE	MEDICINE CABINET	PROVINCIAL	SUPT'S OFFICE
5th GRADE	BOARD OF EDUCATION	DIETICIAN'S OFFICE	HISTORY	MUSIC	PRIMARY DEPT.	STUDENT ROOMS
6th GRADE	BOYS	DINING ROOM	HOSE TOWER	MANUAL ARTS	PRESCRIPTIONS	STORE ROOM
7th GRADE	BOYS →	DISPENSARY	HOME ECONOMICS	NORMAL TRAINING	PUBLIC	STAGE
8th GRADE	← BOYS	DOCTOR	INFORMATION	NURSE	PUSH	SCOUTS
1st - 2nd GRADES	BOYS' LOCKER ROOM	DOCTOR'S ROOM	INDUSTRIAL ARTS	NURSERY	PULL	S. H. ASSEMBLY
2nd - 3rd GRADES	BOYS' SHOWER	DOMESTIC SCIENCE	INQUIRY	NEXT WINDOW	PUBLIC PHONE	SCIENCE
3rd - 4th GRADES	BOARD & ROOM	DORMITORY	INTERNES	NEXT WINDOW →	PUBLIC SPEAKING	SCI. STORAGE
4th - 5th GRADES	BOILER ROOM	DRAFTING	INTERMEDIATE DEPT.	← NEXT WINDOW	PARSONAGE	TEACHERS
5th - 6th GRADES	BOILER ROOMS	DRESSING ROOM	JANITOR	NOTARY PUBLIC	QUIET PLEASE	TEACHER TRAINING
6th - 7th GRADES	BOOKKEEPER	DRUG ROOM	JUNIOR DEPT.	NO ADMITTANCE	RESERVED	TELEPHONE
7th - 8th GRADES	BOOKKEEPING ROOM	ELEM. GRADES	J. H. ASSEMBLY	NO CREDIT	REST ROOM	TICKET OFFICE
1st - 2nd - 3rd GRADES	BOOK ROOM	ELEVATOR	KEEP DOOR CLOSED	NO DELIVERIES	READING	TOILET
3rd - 4th - 5th GRADES	BOOK STORE	EMPLOYEES ONLY	KITCHENETTE	No Soliciting Allowed With out Permission of Supt.	RECITATION	TOOL ROOM
4th - 5th - 6th GRADES	BOTANY	ENGINEER	KEEP OUT		READING ROOM	TRADESMEN
6th - 7th - 8th GRADES	CAFETERIA	ENTRANCE	KINDERGARTEN	NO VACANCIES	REGISTRAR	TUB BATH
Room A	CASHIER	ENGLISH	KINDERGARTEN DEPT.	NO SMOKING	RING BELL	TURN OUT LIGHTS
Room B	CALL YOUR FLOOR	EXIT	KITCHEN	NO SOLICITORS	2 ROOM APTS.	TRADESMEN TAKE SIDE ENTRANCE
Room C	CHAPEL	EXIT →	LATIN	NO LOITERING	3 ROOM APTS.	
Room D	CHEMISTRY	← EXIT	LECTURE ROOM	NO CHECKS CASHED	2 & 3 ROOM APTS.	TREASURER
Room E	CHECK ROOM	FIRE ESCAPE	LOCKERS	No Peddlers Or Agents	SCHOOL BOARD	TYPING
Room F	CHIEF'S OFFICE	FURNISHED	LABORATORY	OBSTETRICAL WARD	SCHOOL NURSE	TYPEWRITING
Room G	CHIEF OF POLICE	FURNISHED ROOMS	LADY TEACHERS	OFFICE	SHOP	USE OTHER DOOR
Room H	CHIEF ENGINEER	FIRE APPARATUS	LADIES	OFFICE →	SOCIAL ROOM	UTILITY ROOM
ACCOUNTS PAYABLE	CHILDRENS WARD	FOR RENT	LADIES' BATH	← OFFICE	SOCIAL SCIENCE	UNFURNISHED
AGRICULTURE	CHEMISTRY	FOR SALE	LADIES' LOUNGE	OPEN	STUDY	VACANCY
ALGEBRA	CHOIR ROOM	FOR MEMBERS ONLY	LAVATORY	OPERATING ROOM	STUDY HALL	VICE PRESIDENT
APARTMENTS	CIVICS	FRENCH	LAUNDRY	ORDERS	STUDY ROOM	VISITORS
APTS. FOR RENT	CLINIC	GALLERY	LIBRARY	PLEASE FLUSH TOILET	SPLINT ROOM	VOCATIONAL AGR.
ARITHMETIC	CLOAK ROOM	GARAGE TO LET	LIBRARIAN	PHYSICS-CHEMISTRY	SECRETARY	WALK IN
ART	CLOSE THE DOOR	GENTLEMEN	LOBBY	PARLOR	SENIOR DEPT.	WASH ROOM
ART ROOM	CLUB ROOM	GENTS' BATH	LANGUAGE	PAY HERE	SEWING ROOM	WASH YOUR HANDS
ART SUPERVISOR	CLOSED	GENERAL OFFICE	LANGUAGES	PASTOR'S STUDY	SHOWER BATH	WAITING ROOM
ASSEMBLY ROOM	COLLECTIONS	GENERAL SCIENCE	LATIN & ENGLISH	PHYSICS	SMOKING ROOM	WRITING ROOM
ASSEMBLY	COMMITTEE ROOM	GEOMETRY	LOUNGE	PHYSICAL DIRECTOR	SPANISH	WOMEN
ATHLETICS	CONTROL ROOM	GEOGRAPHY	MATH. & SCIENCE	PRIVATE	SERVICE	WOMENS' SHOWER
AUDITORIUM	COMMERCIAL	GERMAN	MUSIC STUDIO	PRIMARY	STERILIZING ROOM	WORK ROOM
AUTOPSY	COMMERCIAL DEPT.	GIRLS	MUSIC SUPERVISOR	PHYSICAL CULTURE	STUDIO	X-RAY ROOM
BANDAGE ROOM	CORRECT SPEECH	GIRLS →	MATHEMATICS	PREFECT	STOCK ROOM	ZOOLOGY
BASAL MET. ROOM	COUPLES ONLY	← GIRLS	MANAGER	PARCELS	SUPPLIES	
BASEMENT	CREDIT DEPT.	GIRLS' LOCKER ROOM	MEMBERS ONLY	PLEASE TURN OUT LIGHTS	SUPPLY ROOM	

HOFCO School Bus Signs

Schools are continually ordering these attractive signs, made of heavy steel, with black embossed letters and border on white background. The size is 40″ by 4″. $1.50 each.

Additional Items for School Use Include:

Set No. 4330 Stamperkraft Rubber Type Printing Outfit, containing the equivalent of nine complete alphabets, 264 characters in all—together with punctuation marks, numerals, etc.; with stamp pad, assorted type holders, and tweezers. $1.25. Set No. 4300 Stamperkraft Story Printer, containing 219 sentence-making word stamps such as "the," "am," "cow," "blue," etc.; 36 picture printing characters such as cow, circle, boy, table, etc.; 10 numerals, one font of rubber type; and working equipment—ink, ink pads, type holders, tweezers—packed in substantial wood box 12 x 21″ with removable tray. Price $10. A valuable help for primary grades.

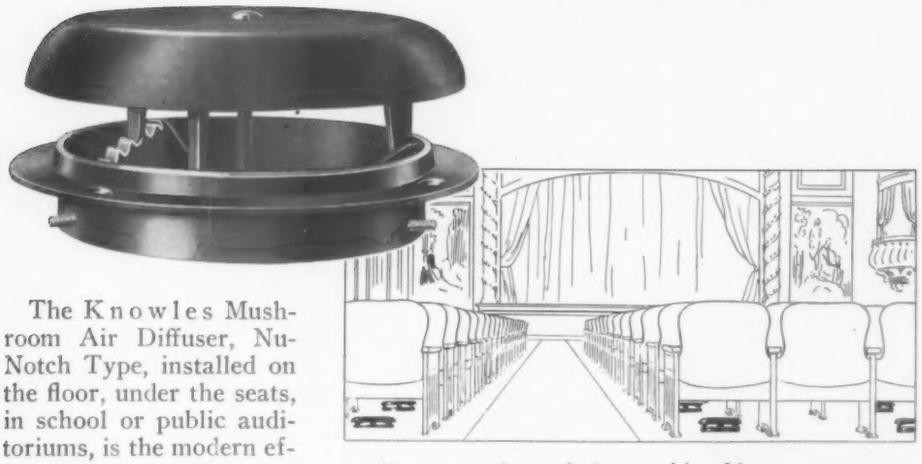
KNOWLES MUSHROOM VENTILATOR CO.

41 North Moore Street, New York, N. Y.

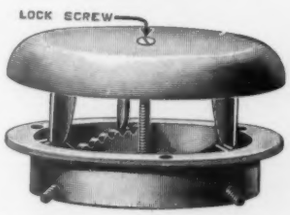
FACTORY—Newark, New Jersey

Knowles Mushroom Air Diffuser
The **Nu-Notch** Type

MADE OF CAST IRON

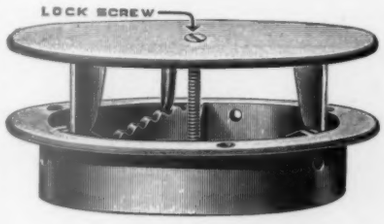


The Knowles Mushroom Air Diffuser, Nu-Notch Type, installed on the floor, under the seats, in school or public auditoriums, is the modern efficient way to provide every pupil, or member of the audience, with the correct amount of conditioned air. The Nu-Notch distributes the **correct volume** of properly conditioned air, at **lowest cost,** to all parts of auditorium by the vacuum effect of the exhaust mushrooms.



Above — **Dome Top Cap for regular use**

Below—**Flat Top Cap, for use where seats are too low for the dome top. (Occupies same area as Dome Top type)**



FEATURES OF THE NU-NOTCH AIR DIFFUSER

Durable—Made of cast iron; often outlasts the building in which it is installed.

Easy to regulate—A part turn of the cap makes all adjustments.

Tamper-proof—The self-locking bolt can be unlocked only with a special key.

Accurate—Flow of air can be regulated to the fraction of a cubic foot per minute.

Simple—Only three parts: the bottom floor piece, cap, and bolt.

Two types of caps—As illustrated.

Smooth tops—No dirt-collecting indentations.

Caps always rigid and secure—Held by three supports in recessed notches at the periphery (see illustration).

Not easily damaged—Jarring or stepping on the top cannot move or harm the cap, or disturb proper adjustment.

Adaptable—Ten different adjustments are possible.

Not injured by floor-cleaning—The collar encircling the floor piece prevents dirt and water from entering the air duct.

Air flow not restricted—Notches are cast inside the collar, distributing the full area. The caps are also free from obstructions that would form air pockets retarding the easy flow of air.

Correct volume of air per individual, in any size auditorium.

No discomfort nor danger from drafts.

Adaptable to various types of floors—such as wood, concrete and monolithic.

Five diameter sizes—to fit the ventilating needs of any type of auditorium.

In successful operation in thousands of buildings in this country and abroad.

ILLUSTRATED CIRCULAR

A copy of our illustrated circular showing complete line of "Knowles Air Diffusers" will be sent promptly on request. In this circular are tables of sizes with capacities and volume specifications for installing, and a list of some of the many public schools, high schools and colleges having auditoriums equipped with Knowles Diffusers.

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926 W. Juneau Ave., Milwaukee, Wis.

"Lock Up" with MASTER PADLOCKS

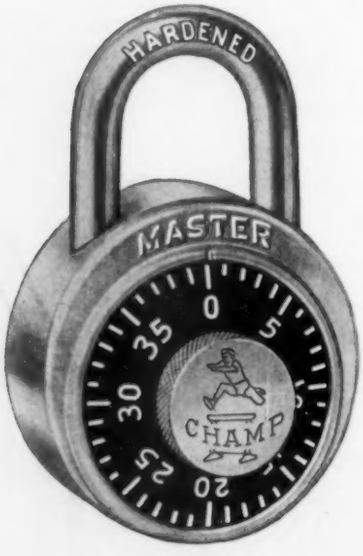
In all price ranges there's nothing to compare with the extra value and protection built into "MASTERS"

Here is the most modern and up-to-date combination padlock . . .

Master "CHAMP" No. 100
Lists at 75¢ each

Many patented mechanical improvements—a combination padlock built like a safe—offering more than 200,000 combinations.

See your source of supply or write us for full details



No. 100 "Champ"

Strong $1\frac{15}{16}$ inch double-wall case of nickel silver and cadmium plated steel . . . Smooth working brass locking mechanism . . . self-locking steel shackle, hardened and nickel plated . . . automatic double-acting brass locking lever . . . brass dial finished in black gloss—step graduations and numerals in white . . . solid brass knob, knurled edge . . . more than 200,000 combinations

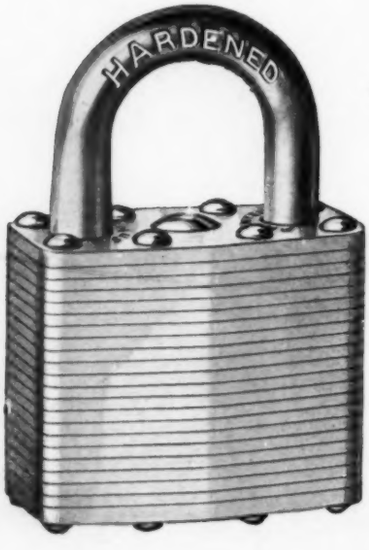
Master "Secret Service" No. 7 Lists at 50c. each

World-wide Popularity to Master's "SECRET SERVICE"

Greatest Combination of Protective Features Ever Known

There are many styles and types of Master Padlocks amongst which "Secret Service" is most prominent. They are preferred by lock experts throughout the world.

LAMINATED—Built like a Bank Vault Door.



Master "Secret Service" No. 1 Lists at $1.00 each

THE AMERICAN SCHOOL AND UNIVERSITY

METAL OFFICE FURNITURE COMPANY

Grand Rapids, Michigan

FACTORIES IN Grand Rapids Michigan

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STEELCASE *Business Equipment*

DESKS AND TABLES

Four grades of desks and tables are available for every office requirement. Made in a complete range of types and sizes. The moderne, No. 5021, Flat Top Desk, as illustrated, is attractive, efficient, economical and will give a lifetime of service.

SECTIONAL EQUIPMENT

Adaptable to large offices or to small departments or offices where requirements are limited to no more than a single letter file and a card index file. Extreme flexibility of wide and narrow sections permits additions to serve every need.

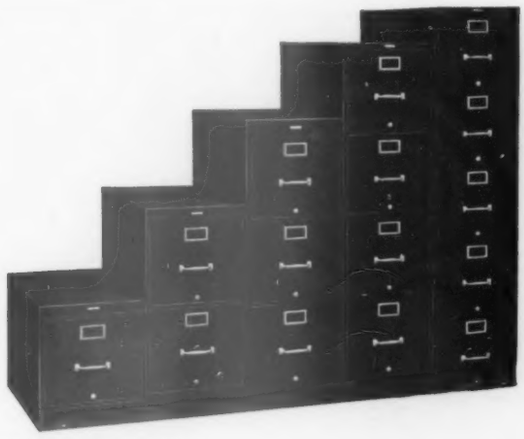
BOOKCASES

These glass door bookcase sections are substantially constructed units, carefully designed and built. Doors are of disappearing type, dust-proof with equalizing device. Three heights, with top and base, intermember perfectly, permitting easy expansion.

Built-to-Order Equipment

Display and Museum Cases

Write for Details



FILING CABINETS

Steelcase files are made in several grades of construction, in suspension and non-suspension types, in various heights from 5-drawer down to single drawer units, in a drawer arrangement for every purpose, in attractive and substantial finishes.

STORAGE CABINETS

Twenty-one sizes and styles of cupboards and wardrobes provide a stock unit for every storage requirement. They are attractively finished, strong and sturdy in construction and very convenient and adaptable in use.

SHELVING

Three types of steel shelving provide the proper kind for use wherever shelf storage is required, whether in libraries where an attractive appearance is necessary or in store-rooms where heavy loads require reinforced shelves.

SAFES

Steelcase safes are furnished in two grades — a Class "B" and "T-20" Grade for extreme risks where safety and protection of records is most important and a Commercial Grade for less exacting conditions. A full range of sizes.

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Established 1896

Manufacturers of

Miller Line Inked Ribbons, Carbon Papers and Stencil Inks

FROM the simple typewriting needs of the nineties to the multitudinous writing machine requirements of 1937, the Miller Line has kept faith with the users of writing machines by providing a right ribbon for every writing requirement and a correct carbon for every copying condition as it developed.

MILLER LINE INKED RIBBONS

Made regularly in all standard colors and standard color combinations, record or copying, and in seven different degrees of inking, for any machine requiring an inked ribbon:

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MILLER LINE CARBON PAPERS

Made in a complete variety of weights and finishes, in all standard colors and sizes, for any purpose where a carbon paper may be utilized:

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CARBON ROLLS
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MILLER LINE STENCIL INKS FOR ROTARY DUPLICATING MACHINES

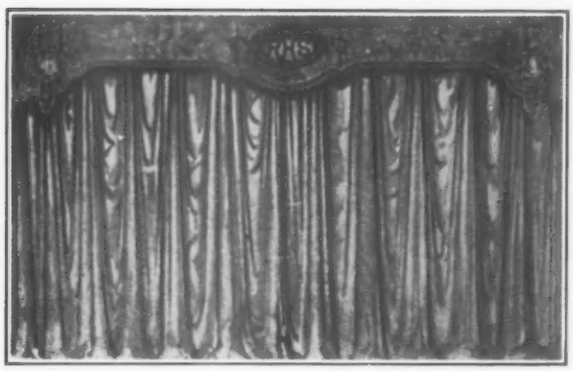
Open drum, closed drum, fountain feed, portable.

Prompt and careful attention given to special or unusual requirements by our Research and Development Departments

The Miller Line MILLER LINE is Superfine

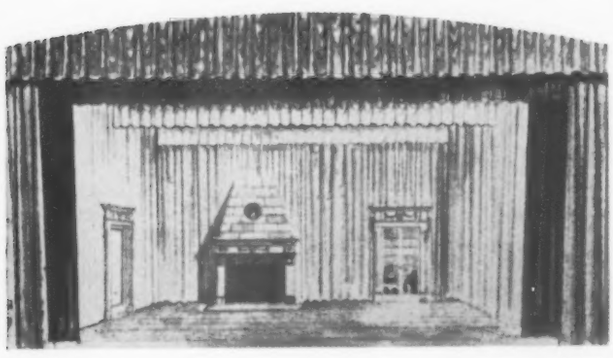
NOVELTY SCENIC STUDIOS, INC.

320 West Forty-Eighth Street, New York City



Draperies designed and executed to conform with architectural treatment. The embellishment adds to decorative value, preserving functional requirements.

Many other styles available.



Interior effects produced by combination of cyclorama curtains and a few set pieces. Entire set-up is interchangeable. This illustrates the NOVLFLEX setting; adaptable on any stage.

Back drop and garden setting may be reproduced realistically as shown, or depicted stylistically if desired. Drop is mounted on roller where head room is limited.

Many other designs are available.

This company has been serving schools, churches, theatres, amateur groups for sixteen years continuously. Notable installations and satisfied customers in every section of the country.

STAGE CURTAINS, SCENERY, DRAPERIES, RIGGING, NOISELESS CURTAIN TRACKS, CURTAIN CONTROLS; DECORATIONS, MURALS, DISPLAYS.

Inquiries invited. Write for samples, prices, layouts.

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World's Largest Manufacturers of Instantaneous Recording Equipment

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THE PRESTO PROFESSIONAL RECORDER (right) makes records up to 16" in diameter playing 15 minutes continuously. It is used by school dramatic clubs, orchestras and glee clubs to make electrical transcriptions for broadcasting. Designed in accordance with the most modern principles of sound engineering, the Presto Recorder is used by the largest universities, radio broadcasting stations and recording studios. Throughout the world, the Presto Recorder is the accepted standard for high grade recording equipment. Complete equipment consists of recording turntable, amplifier, pre-amplifier and dynamic or velocity microphone.

THE PRESTO MODEL D RECORDER (left), a low priced, portable recorder in a single unit. Designed for classroom work in speech courses. Widely used in the teaching of music, dramatic expression and foreign languages. Makes records up to 12" in diameter, playing 5 minutes continuously. Exceedingly simple and economical to operate. Plugs in to any 110 volt A.C. outlet.

THE PRESTO GREEN SEAL DISC, universally accepted as the finest instantaneous recording disc made. Freedom from needle scratch, faithfulness of reproduction and long wearing qualities make this disc ideal for school use. Presto records can be played with steel needles on any phonograph.

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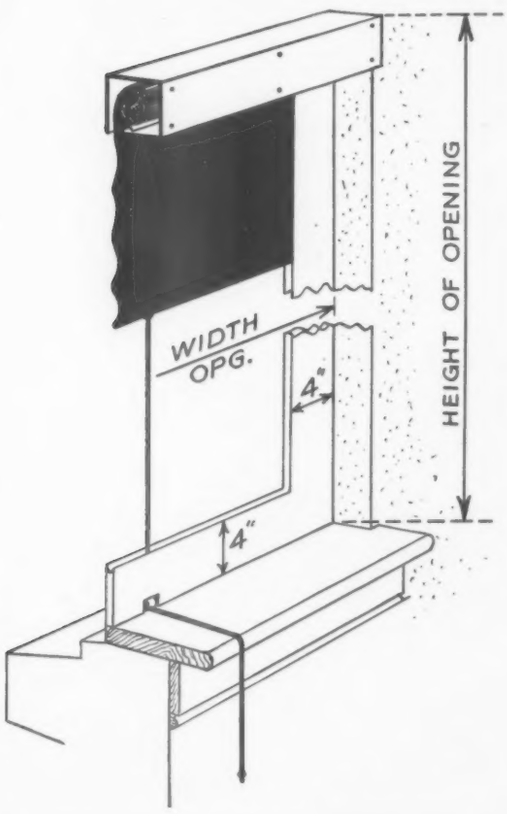

Electrically Operated, Light Proof Shades

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The numerous outstanding installations of our **Light Proof Shades** endorse the popularity of **Ray Proof** manufacture.

Selected for schools, hospitals, auditoriums, X-Ray departments, surgical operating rooms, as well as class rooms for visual educational work, determines the high regard for **Ray Proof** equipment by architects and institutions.

The refinement of detail, care and precision in manufacturing and installing, ease and permanency of operation and negligible maintenance requirements are just a few factors we stress. Every job, without exception, receives extremely careful study as to detail and application, assuring results that speak for themselves.

A **Ray Proof** product is always of high quality. It is your bond of protection supported by the established integrity of the **Ray Proof Corporation.**

We maintain an engineering department to advise, design and to furnish you with complete details and information for your guidance. Please feel free to use it.

WRITE FOR COMPLETE DETAILS AND SPECIFICATIONS

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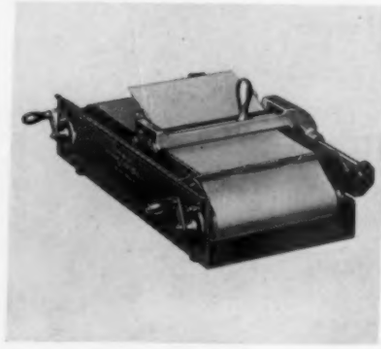
BRANCH OFFICES IN 39 PRINCIPAL CITIES. DEALERS EVERYWHERE

Makers of L C Smith Standard Typewriters—L C Smith Silent Typewriters—Corona Portable Typewriters — Vivid Duplicators — Corona Adding Machines—Type-Bar Brand Ribbons, Carbons, and Supplies.

For 30 years, L C Smith has been an outstanding name in the **office typewriter** field—for sound design, honest construction, and long-lived efficiency. For almost a like period, Corona has been the foremost name in **portable** typewriters. Their combined experience and good name stand behind every L C Smith & Corona product.

Vivid Duplicator



Vivid Junior

Reproduces everything that can be drawn with pen or pencil or typed — in up to eight colors—for a cost of only a few cents per 100 copies. Invaluable for seat work tests, assignments and many types of projects; saves endless dictating and copying time. Vivid Rolls, for all types of gelatin duplicators, give exceptionally bright and uniform results.

Corona Adding Machine

Corona Adding Machine

Low price, convenient portable size. All standard features including All-Visible keyboard; automatic ciphers; automatic signals; all feature keys; large, legible printing properly punctuated; large capacity. For school or office.

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Excellent quality de luxe and standard grades, for every typewriter requirement. Ribbons are evenly inked, lightly or heavily as desired. Carbon papers are carefully graded for uniformity.

The New Silent L C Smith Office Typewriter

The New Silent L C Smith Office Typewriter

The pioneer silent machine of **standard** design—hence may be operated at the same high speed and efficiency as the standard typewriter. Machine noises have been virtually eliminated, and impact noise substantially reduced. Highly popular for secretarial work—reducing nerve strain and operating fatigue to a minimum. Smith Floating Shift, ball-bearing typebars, interchangeable platens, etc.

The New Standard L C Smith Office Typewriter

The famous "ball-bearing typewriter," noted for its ease and speed of operation—long the favorite of court reporters and other typists who require the utmost in dependability. Many exclusive features. Decimal or key-set tabulator, Smith Floating Shift, right or left-hand carriage return, half-spacing, etc., etc. A wide variety of carriage widths, type-faces, and special keyboards to order.

Corona Silent

Corona Standard

Two of the four regular Corona models—almost indispensable for personal typing, and highly popular with students, travelers, and novelists. All the usual features, plus certain exclusive Corona features—floating shift, piano key action, touch selector, etc. Complete with carrying case. Now available on easy payment terms.

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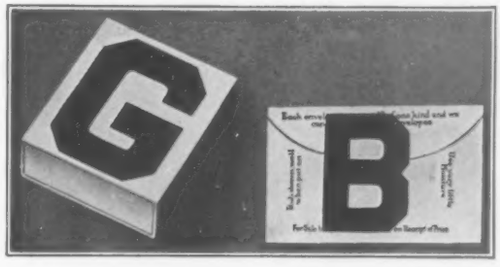
WILLSON'S GUMMED PAPER LETTERS & FIGURES

"As Easy to Use as a Postage Stamp"

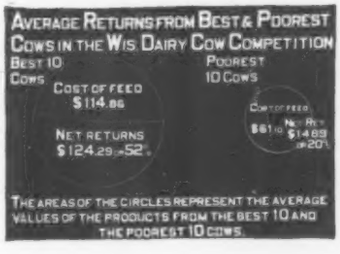
THE PRODUCT

Willson's Gummed Paper Letters, Figures, Symbols and Tape are die-cut from best quality glazed, waterproof, gummed paper. They are easily applied and attractive in appearance.



STYLES

Three styles of letters and figures are available —Cheltenham, Block, and Gothic. These styles have been standardized because of their legibility and general acceptance as most desirable for display lettering. Sizes from ⅛-inch to 4 inches high.


AVERAGE RETURNS FROM BEST & POOREST COWS IN THE WIS. DAIRY COW COMPETITION
BEST 10 COWS
COST OF FEED $114.86
NET RETURNS $124.29
POOREST 10 COWS
THE AREAS OF THE CIRCLES REPRESENT THE AVERAGE VALUES OF THE PRODUCTS FROM THE BEST 10 AND THE POOREST 10 COWS.

USES

Willson's Gummed Paper Letters, Figures, Symbols and Tape are especially adapted for making flash cards, analytical charts and graphs, signs, indexes, marking files, records, maps, etc. Used in every type of educational and administrative work.

COLORS

Standard stock colors of letters and figures are white, black and red. Symbols and tape carried in white, red, black, blue, green, orange, silver, gold. Special colors cut on order.

PACKING

Letters and figures are packed 10 of one character to an envelope or 100 of a character to a box. Symbols are packed in boxes of 100 only. Assortments of 1,000, 2,000 or 5,000 characters are the convenient and economical method of purchase, the envelopes and boxes being purchased as refills for the handy assortment boxes as needed.

MENU RACKS

Willson's Gummed Paper Letters and Figures are used widely in school cafeterias, with our Ladder Menu Rack shown here, one of several types. Write for particulars on Cafeteria Sign Equipment.

Send for Free Samples. Generous envelope of Willson's Gummed Paper Letters and Figures, and our latest catalog, showing forty styles and sizes, sent on request.

OTHER PRODUCTS MANUFACTURED BY THE TABLET & TICKET CO. ARE

CHANGEABLE CLASS SCHEDULES
CHANGEABLE ANNOUNCEMENT BOARDS
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Established 40 Years

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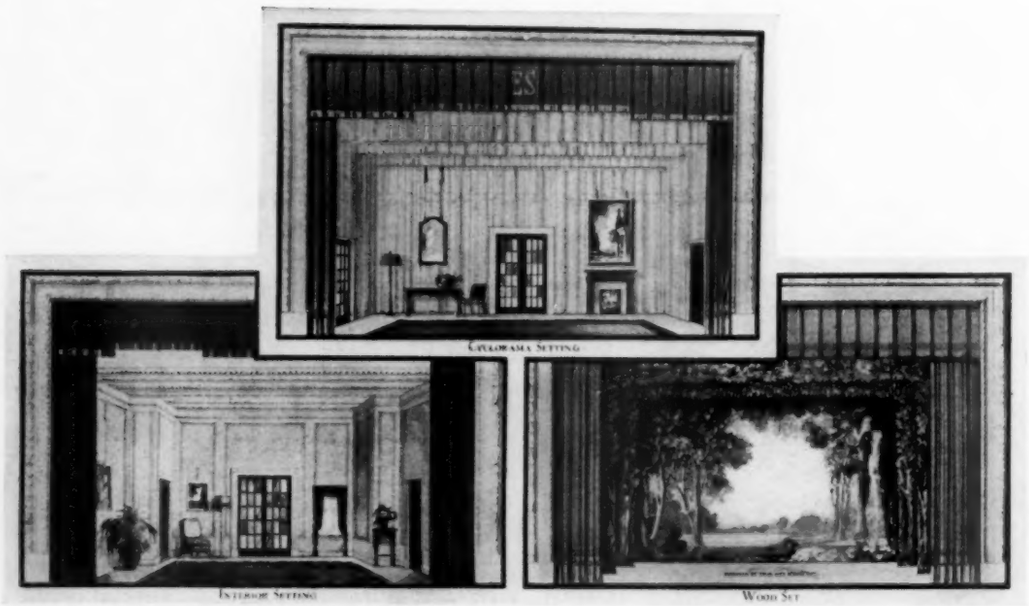

WE SPECIALIZE IN

Stage curtains, auditorium draperies, cyclorama settings, stage electrical equipment, lighting, rigging, hardware and curtain tracks.

Expert advice furnished for planning your stage and estimates submitted without charge.

Just check the items given below in which you are interested and call, or write, to our nearest office and we will be glad to give you complete information.

CURTAINS	STAGE EQUIPMENT	ELECTRICAL
STAGE CURTAINS	SCENERY	FLOOD LIGHTS
WINDOW CURTAINS	PICTURE SCREEN	FOOTLIGHTS
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CYCLORAMA SETTINGS	STAGE PROPERTIES	SPOT LIGHTS
CURTAIN MOTOR	STAGE RIGGING	BORDER LIGHTS
CURTAIN TRACK	STAGE HARDWARE	OLIVETTES
WINDOW TRACKS	LOCKING RAILS	CURTAIN CONTROLS

VOGEL-PETERSON CO., INC.

Manufacturers of Peterson Checkroom and Wardrobe Equipment

1811 North Lincoln Street, Chicago, Ill.

Products

Peterson All-steel Checkroom and Wardrobe Equipment for clubs, hotels, auditoriums, theaters, museums, churches, schools, banks, stores, offices, hospitals, etc., consisting of Stationary and Portable Floor and Wall Racks; Overshoe, Umbrella and Baggage Racks; Racks for Bathhouse Checkrooms; and Costumers.

T. M. Reg. U. S. Pat. Office

The Peterson One-check Checking System

Advantages—Unlike any other checking system the Peterson One-check Checking System increases speed, eliminates errors and utilizes any given space to provide the greatest capacity. Coats, hats, packages, umbrellas, canes, overshoes are taken care of quickly and accurately with the least possible expenditure of space or effort.

Operation—Each coat goes on its own hanger where it is held in shape; it is not subjected to the damaging results of sagging on an ordinary hook. Each hat has its correspondingly numbered section above the hanger. Canes, umbrellas, rubbers, overshoes or luggage are disposed of with equal care by means of systematically numbered umbrella, overshoe and baggage racks.

Regardless whether one or all of the above items are checked, it is only necessary for the guest or patron to be given one check which identifies every item. Only the Peterson One-check System offers this remarkable service.

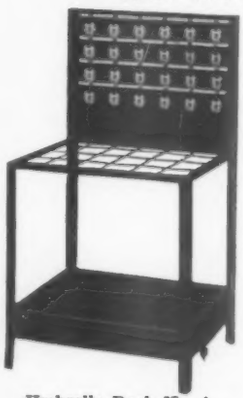
Service

Our long experience in solving checkroom problems fits us to plan arrangements which will insure the greatest all-round efficiency. We will gladly submit to architects, gratis, blueprints indicating the most practical checkroom arrangements. Complete catalogue describing the Peterson system and equipment sent on request.

Left:
Portable Rack No. 8
Capacity 48 coats and hats. Length 6 ft.; width 2 ft.; height 6 ft. 7 in. Panel ends in walnut, mahogany, or oak. Panels can be furnished for stationary racks.

Right:
Floor Rack No. 2
Length 3, 4, 5 and 6-ft. sections; height 6 ft. 7 in.; width 2 ft. Sections interlock, thereby providing a rack of any required length. Same applies to all racks.

No. 1 Portable—Same as No. 2 with casters added.



Umbrella Rack No. 4
Height, 34¼ in.; width, 1 ft.; length, 1 ft. and up. Capacity, 16 umbrellas to each 1 ft. length. Drip pan has pet cock for draining.

Overshoe Rack No. 7
Compartments 6x6x13 in. Standard height 3 ft. 3 in. Any length required. Usually used as counter or placed under existing counter.

Specifications and Construction De'ails

Frames—End and intermediate frames are interchangeable. They are of two-post construction. Posts are No. 18 gauge 1½ in. square tubular steel. Cross arm shelf supports are No. 15 gauge channel-formed steel to receive ends of shelving. Bases—No. 14 gauge 2½ ins. x 1 in. x 2 ft. ¾ in. enclosed top and four sides, with reinforced welded corners. Bases also equipped with vacuum-cup rubber shoes, eliminating necessity for anchoring. All joints electrically welded.

Shelving—New style dust-free perforated and embossed one-piece steel shelving having ⅝ x ¾ x ⅛-in. hard steel angle reinforcement. Also to this is added a ½-in. steel channel for number strips. Hat dividers at 1-ft. intervals embossed into shelving. Hat spacers have rear as well as side divisions. Coat hanger rail supported independent of shelving, thereby causing no undue strain to that portion of rack.

Wall Brackets—Similar in construction to end frames except having No. 3 gauge back supporting member. All connections electrically welded.

Throughout entire construction of all parts, there are no welded joints that will receive a shearing strain.

Capacity—8 coats and 8 hats per lineal foot of floor type rack. 4 coats and 4 hats per lineal foot of wall type rack.

Hangers—One-piece hardwood hanger. No. 10 hard steel rustless wire. Auxiliary hook below.

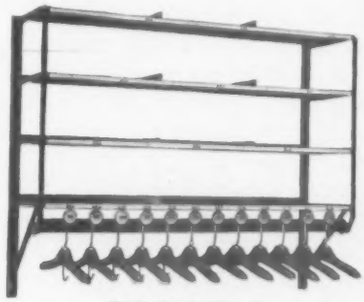
Numbering—Large, clear, and legible numerals impressed into white fibreloid.

Hardware—All hardware cadmium plated. Shakeproof washers for all bolted connections.

Finish—Two coats mahogany-walnut brown enamel. Any other color by request.

All equipment furnished complete ready for use.

Peterson Checking System is fully protected by U. S. Patent.



Wall Rack No. 3
Length 3, 4, 5 and 6-ft. sections. Width 12 in. Height installed 6 ft. 7 in. Sections interlock.

No. 3F Wall Rack—Same as above except attached to floor frames.

Rack No. 3U
The only wardrobe rack that combines space for umbrellas and overshoes as well as coats and hats.

Splendid wardrobe for classrooms and offices. Height, 6 ft. 7 in.; depth, 1 ft. 4 in.; length, 4 ft. 2¾ in. Furnished with or without casters. Interlocking sections of any length can be supplied.

Leading Schools Use Peterson Checkroom Equipment

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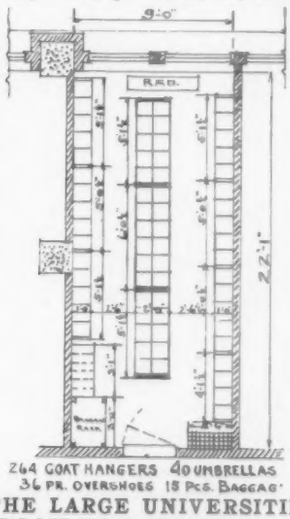
Bayonne High School, Bayonne, N. J.
Shaker Heights High School, Cleveland, Ohio
Stephen F. Austin State Teachers College, Nacogdoches, Texas
East Texas State Teachers College, Commerce, Texas
Sam Houston State Teachers College, Huntsville, Texas
S.W. Texas State Teachers College, San Marcos, Texas
Corpus Christi School, New York City
St. Ignatius' School, Chicago, Ill.
St. Gregory's School, Chicago, Ill.
Chico State College, Chico, Calif.
State A. & M. College, Orangeburg, S. C.
Columbia University, New York City
University of Chicago—International House, Reynolds Club — Chicago, Ill.
University of Iowa, Iowa City, Iowa
University of Indiana, Bloomington, Ind.
University of Michigan — Michigan League—Ann Arbor, Mich.
University of Minnesota, Minneapolis, Minn.
University of Texas, Austin, Texas
University of Wisconsin, Madison, Wisconsin



GRADE HIGH SCHOOLS AND MANY OF THE LARGE UNIVERSITIES ARE USERS OF PETERSON CHECKROOM EQUIPMENT

WEBSTER-CHICAGO

3825 W. Lake St., Chicago, Illinois

SECTIONALIZED SOUND SYSTEMS

THE UTMOST IN FLEXIBILITY

- Low Cost
- High Quality
- Simplicity of Operation
- Easy Maintenance
- Sectionalized Construction

Permanent Magnet Speakers. Require the running of only two wires to install. (As simple as installing an electric push button)

Here is just what schools have needed . . . A base sound system that can be installed at once . . . and that can be added to as conditions require or funds permit . . . at absolutely no sacrifice in efficiency. Incorporates all the latest, most modern features including . . . Radio Receiving Set, Crystal Microphone, Electric Phonograph Turntable . . . Permanent Magnet Speakers . . . Emergency Cut-In Switch to All Points . . . Two-way communication from central control to each point and return (optional) . . . additional sections easily connected by plugs and receptacles on amplifiers . . . only two wires need be run for each speaker.

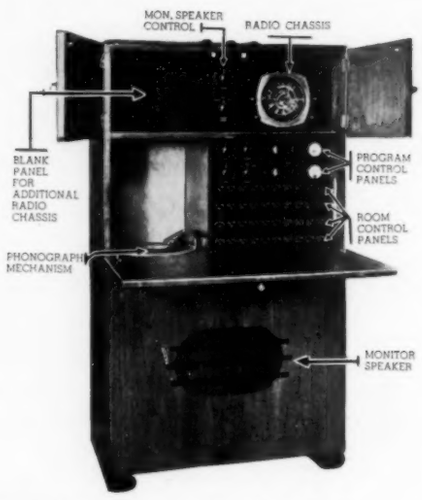
The unit base system, shown above with one amplifier and 10 speakers, serves ten rooms . . . write for catalogue giving complete details.

Webster-Chicago are old established manufacturers of public address equipment, sound systems and accessories of all kinds. All products are carefully engineered to give maximum trouble-free operation with continuous use.

Send for Catalogue

Our engineers are at your service for special installation problems or custom built models.

LICENSED UNDER ALL IMPORTANT PATENTS



Cabinet for Sectionalized System . . . one amplifier serves 10 rooms . . . cabinet holds from one to four amplifiers serving 10 to 40 rooms

SYNCHRONIZED WEBSTER CHICAGO SOUND EQUIPMENT

OTHER WEBSTER-CHICAGO PRODUCTS

Portable Sound Systems from 8 to 20 Watts

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Improve classwork with proper illumination . . . *easy* with these WESTON Illumination Control and Measuring Devices

No longer is it necessary to theorize concerning the relationship between good lighting and good scholarship. In one school where adequate classroom illumination was provided and automatically controlled, failures were reduced by 60%. In another, a 28% improvement resulted from proper lighting. Similarly, schools in all sections of the country now measuring or controlling their illumination with WESTON Illumination Devices, report a marked increase in educational efficiency.

To obtain these benefits of proper illumination, in old schools or new, is today a simple and inexpensive matter. Small, compact WESTON direct-reading light measuring instruments, placed on any desk or held in room location, instantly show the amount of light (artificial or daylight) available in that location. Thus you can make certain, by a quick periodic check, that each pupil has the proper amount of light for proper seeing.

Model 703 WESTON Foot-Candle Meter

And to be sure that students have proper illumination **at all times** . . . "lights on" when needed, but "off" when not needed . . . WESTON automatic Control Relays are being widely employed. This Relay automatically turns lights on when daylight falls below the proper level . . . during storms or on late afternoons . . . and automatically turns them off when nature's light is restored to that level. No attention is necessary; and the device costs practically nothing to operate. Ask us to send you complete information on all WESTON Illumination Devices . . . Weston Electrical Instrument Corporation, 601 Frelinghuysen Avenue, Newark, N. J.

The WESTON Photronic Automatic Illumination Control Relay

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219 Central Ave.

INTER-CLASSROOM COMMUNICATION

THE necessity of a centralized radio and public address system in the modern school is becoming more and more apparent.

Throughout the land *Lafayette* Public Address Systems are proving a boon to Principals and Teachers. They afford a swift means of addressing a part or the whole of the student body at will. The same system which permits addresses from a central source may also be utilized for gatherings in the school auditorium. Countless uses suggest themselves according to the individual requirements of each school.

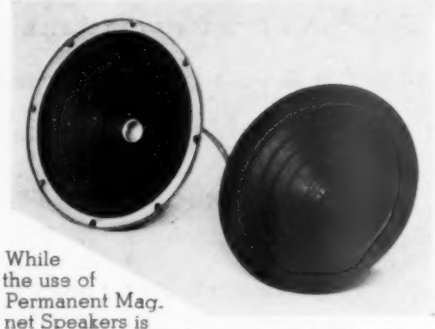
You will be interested in learning more of the potential benefits to be derived from a *Lafayette* Public Address installation in YOUR school. Our engineering staff will be glad to give your problem individual attention upon receipt of your inquiry.

WRITE FOR FREE CATALOG 65-37

ILLUSTRATED HEREWITH ARE SOME OF THE COMPONENTS OF A *LAFAYETTE* PUBLIC ADDRESS SYSTEM PARTICULARLY SUITABLE FOR SCHOOLS

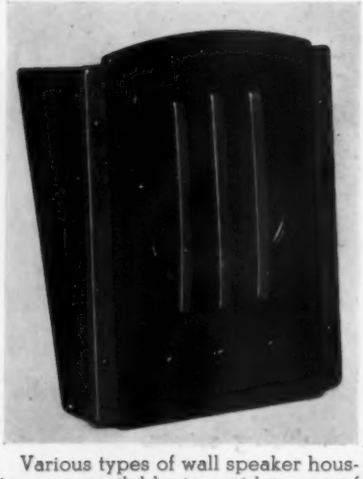
LAFAYETTE SPEAKER CONTROL PANEL

This is the "heart" of the System. Controls for individual speakers are provided — permitting any speaker or group of speakers to be turned on and off at will. There is no limit to the number of speakers which can be accommodated. Systems are custom built suitable to each installation. The amplifier, which is contained in the same unit, has Master Controls for the entire system, such as Volume Control, Tone Control and Power Supply Switch. The easily readable power level meter indicates volume at speakers. This system is easy to operate, no technical skill being required.



While the use of Permanent Magnet Speakers is recommended in the majority of school installations, *Lafayette* provides a full selection of speakers covering a wide price range.

MICROPHONES OF EVERY TYPE



Various types of wall speaker housings are available, in a wide range of prices and to suit every requirement. Illustrated above is a modern, wooden housing, engineered and built to afford maximum tone quality.

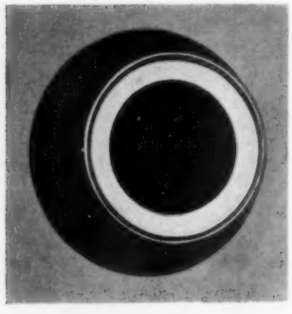
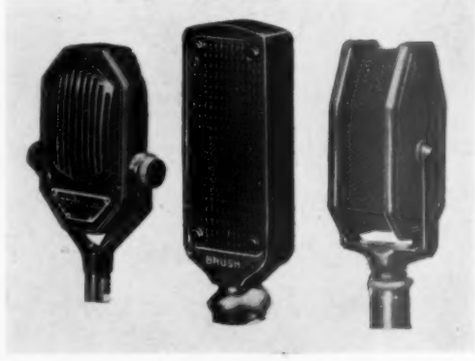


Illustration above shows one of the *Lafayette* circular metal speaker housings, a popular housing where price is a controlling factor. This speaker though less ostentatious than the one shown at the left will deliver equally satisfactory reproduction in schools.



Each installation presents an individual problem, and according to the circumstances governing each case, microphones must be selected with the utmost care. *Lafayette* Sound Engineers will advise you as to the system which will best fulfill your requirements.

Lafayette
CENTRALIZED PUBLIC ADDRESS EQUIPMENT

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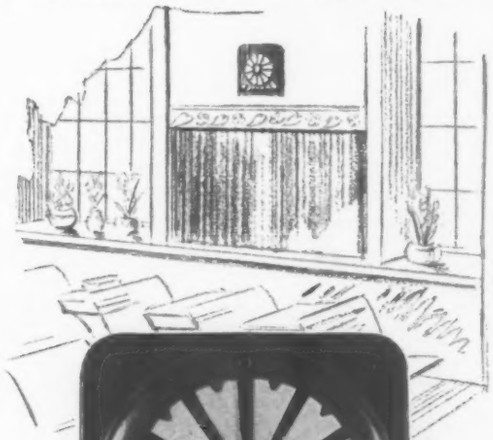
The word NOKOIL was used to introduce the new Permanent Magnet Speakers

STANDARD EQUIPMENT *for* SCHOOLS *and* UNIVERSITIES

It Costs No More to Have the Best



Assure Your Pupils Constant Clear Distinct Reproduction

Model 980
8" Nokoil Reproducer

Models 910 and 920
Flush and Surface Wall Mounting Cabinets

Model 782
10" Nokoil Reproducer

Cabinets come complete with reproducers
There is no other Permanent Magnet Speaker like the Nokoil

- CLASS ROOMS
- AUDITORIUMS
- STADIUMS

Model 1984
12" Nokoil Reproducer

- DEPENDABLE
- POWERFUL
- WEATHER PROOF

Play safe and insist that the word NOKOIL appears on every Permanent Magnet Speaker installed in your School

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THE AMERICAN SCHOOL AND UNIVERSITY

THE YALE & TOWNE MFG. CO.

TRADE YALE MARK Stamford, Conn. TRADE YALE MARK

INTRODUCE true economies, maximum security and increased efficiency in locker rooms with these Yale Combination Locker Locks. They supply a degree of protection heretofore unavailable in locks of this type for locker use; security which discourages temptation, aiding in character development. Large easily read dials simplify operation, and minimize congestion and delay in locker rooms.

FOR ALL MAKES AND ALL TYPES OF STEEL LOCKERS

FOR NEW LOCKERS AND FOR REPLACEMENT OF WORN OUT LOCKS ON OLD EQUIPMENT

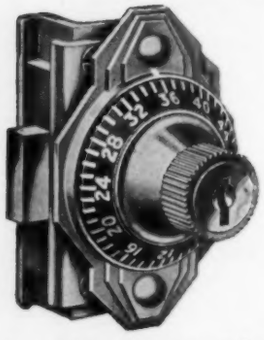
Exclusive Yale Features:

Maximum Security: Combinations dialed on three positive numbers. Combination must be known and cannot be located by manipulating dial.

Combination Disperser automatically upsets combination as lock is locked. A double safeguard. Acts as a defense against tampering.

Combination Changeable with every change of locker occupant—without removing lock from door. Feature secluded in back of lock in same secure manner as in Yale Bank Locks.

Supervisory Control of a group of lockers or the collective groups of a city school system obtained by the **Yale Emergency Key Control.** The key used is assigned exclusively to these locks.



For Lockers with Automatic Bolt Release Mechanism. Automatic Self-Locking Vertical Sliding Bolt. A New Locking Principle.

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No. L3374-CM, Cadmium finish
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Dial Operated Only

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For Lockers with Gravity Type Locking Device. Dead Bolt Manually Operated.

Dial Operated Only

No. L3368-CM, Cadmium finish
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No. L3378-CM, Cadmium finish
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NEW YALE COMBINATION PADLOCKS

FOR BASKET LOCKERS AND ALL OTHER TYPES AND MAKES OF STEEL LOCKERS

The finest and most secure combination padlocks yet produced

No. 589 Master-Key Controlled Dial

Same features of maximum security and automatic combination disperser as the above built-in type.

No. 579 Lock, Dial operation only.

No. 589 Lock, Dial operation with emergency key, provides supervisory control of lockers. May also be used with any of above built-in types under same control key.

These padlocks have ¼″ diameter steel shackles, Combinations unlimited.

No. 429 Lock, Dial operation only. A highly secure medium priced padlock. $\frac{9}{32}$″ diameter shackle. Combinations unlimited.

Above padlocks have Yale Visible Rotating Dial with forty-eight white graduations and numerals contrastingly indented upon black enamelled dial. Simplified operation. Faster, accurate dialing.

No. 429 Dial Operated Only

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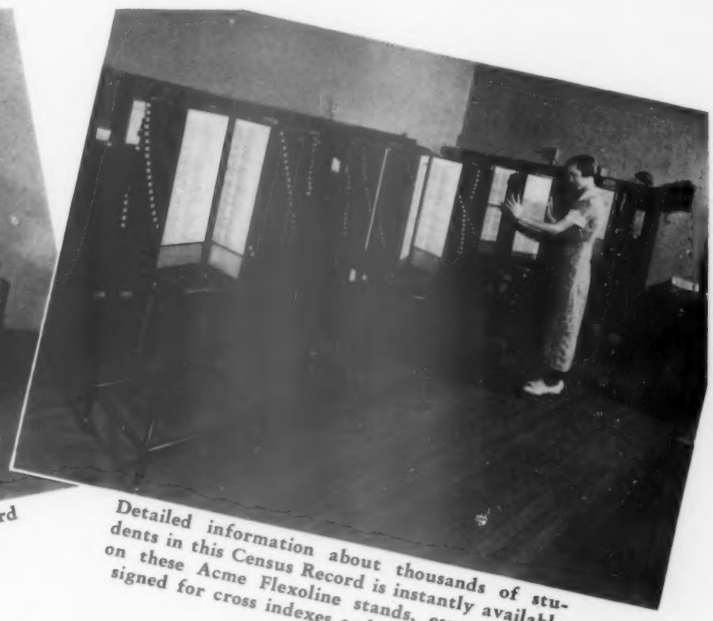
8 So. Michigan Ave., Chicago, U. S. A.

The World's Largest Exclusive Manufacturers of Visible Record Equipment

Illustrating the ease with which Acme Visible Card Records are posted

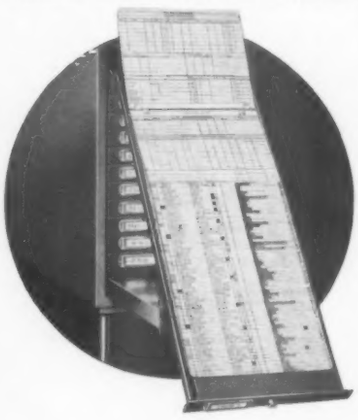


Detailed information about thousands of students in this Census Record is instantly available on these Acme Flexoline stands, especially designed for cross indexes and reference records

VISIBLE FORMS and EQUIPMENT

For Every School Requirement

Visible Card Records Including:



Student:
- **Alumni**
- **Attendance**
- **Census**
- **Cumulative**
- **Grade**
- **Health**
- **Ledger**
- **Program**
- **Registration**

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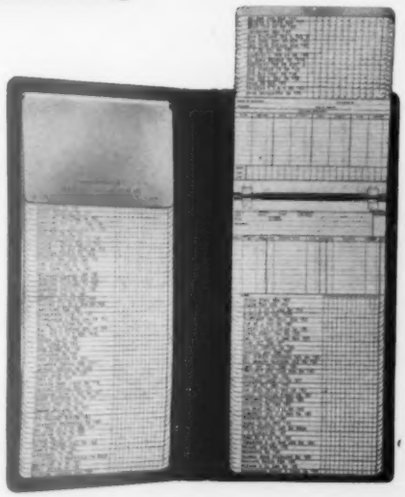
And many other types for special purposes

Acme Desk Stand for Flexoline or Tube Frames. When all the information can be placed on one line (or two), this type of equipment is ideal, especially suitable for constant reference records and for cross indexes, etc.



These Acme Visible Card Book units are admirably suited for class room records . . . compact, portable, all cards visible at a glance

Every type of School Record form may be placed on Acme Visible Equipment to advantage. All records are quickly posted, often saving 50 per cent of the clerical time, and are instantly available for reference, enhancing the value of the record.

The use of signals placed on the visible edge of the cards, directs attention to those cards for the purpose of indicating action or classification.

School Record Department

Various types of Acme Equipment are available to meet special school requirements. Samples of School Record forms are available on request. Please specify the type of record in which you are interested. Your inquiry will receive the attention of our School Department.

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PRODUCTS

The Graybar Electric Company brings to meet any and every electrical need for schools and colleges more than 60,000 electrical supplies—supplies whose dependability is warranted by Graybar's 68 year old quality reputation.

The 79 distributing houses listed above bring these supplies within arm's reach of demand everywhere, making instantly available everything electrical, to transmit, apply and control electricity in school and college buildings.

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School boards, superintendents, and architects can well appreciate the importance of an interior telephone system that knits all the individuals of the teaching staff together—without, at the same time, requiring the services of an operator. Graybar Inter-Phones are simple to operate. The user merely pushes a button to make a connection.

In addition, Graybar supplies many other types of electrical signalling equipment for schools, including bells, buzzers, annunciators, and gongs of every variety with all accessory equipment. Write us for more detailed information.

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We can now supply complete school systems covering Telephone Communication, Fire Alarm, Program Clocks, Laboratory Switchboard and Panels, Complete Public Address or the Program Sound System which is a two channel type arranged to provide pick up from microphones, phonograph reproducers or an all way radio receiver on either channel and will provide two programs simultaneously. It is possible to select any one of the pick ups, amplify it and distribute the program to any one or all the speakers in the class rooms at the same time.

LIGHTING EQUIPMENT

A complete selection of fixtures, glassware and accessory products to meet the specialized needs of school and college buildings is easily available through Graybar.

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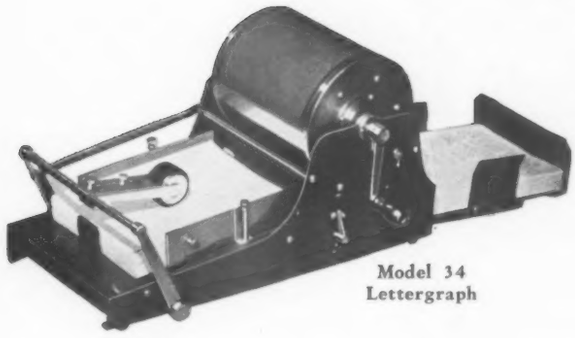

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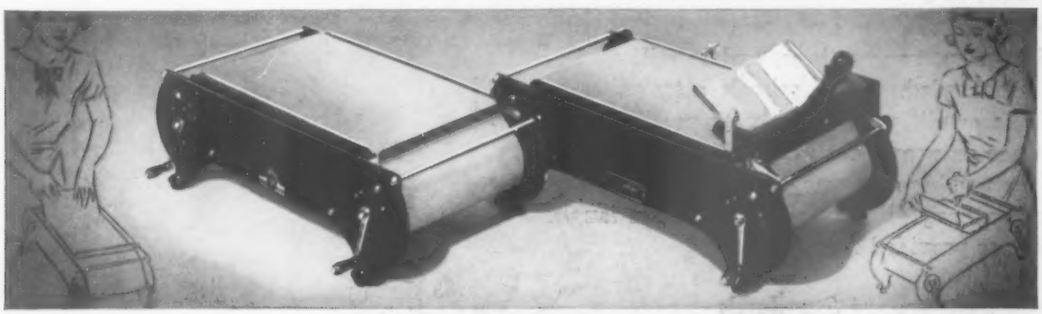

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SECTION VII
CAFETERIA—HOME ECONOMICS—DORMITORY

PLANNING AND EQUIPPING HOME ECONOMICS CLASSROOMS IN HIGH SCHOOLS

BY MRS. LUCILE RUST

Professor of Home Economics Education,
Kansas State College

THE change in the character and scope of home economics has necessitated a new type of classroom and equipment. With the curriculum based upon homemaking, provision must be made for the effective teaching of its various activities. These include planning, preparing and serving meals, marketing, planning family expenditures, care of the sick, laundering, care and training of children, selecting and making of clothing, home planning and furnishing, as well as numerous other phases depending upon the length of the course and the amount of home economics offered.

The number of classrooms needed for home economics varies with the size of the school, the amount of home economics training offered, and the number enrolled in the courses. In some schools one room is sufficient; in others, two or three, and in still others, even more are needed. Some schools attempting to represent home conditions as nearly as possible have found a cottage or apartment most satisfactory. Regardless of the number of rooms, the homemaking idea prevails, and as many different activities as are taught in the course are provided for.

Satisfactory Standards

The standards for home economics rooms in high schools should approximate those that are possible in a good home in the given community. Equipment and furnishings that are beyond what the majority of pupils can have are out of place in any high school. Home economics rooms should be attractive and have a homelike atmosphere. Somewhere in the room there should be at least one "appreciation center" which adds to the pleasure and enjoyment of the pupils. This may be a picture or a textile on the wall, a bowl on a bookcase, or a vase on a table. Plants and flowers always are suitable, and curtains at the windows do much toward giving a friendly appearance. The equipment, in its type and arrangement, should be as nearly like that in the home as is possible. Making the classroom an artificial situation quite unlike the home makes for poor correlation of the school and the home.

The equipment should always be adequate to teach the course offered and to develop good standards of work. It is impossible, in most instances, to say that there is one best piece or type of equipment and that all schools should choose it, for conditions vary in different localities. Then, too, in many instances, there is no universally accepted "best." There are, however, some guiding principles that have been rather generally accepted by home economists for equipping home economics classrooms. Many have found these helpful when faced with problems in equipment. Some of the most important characteristics of satisfactory home economics classrooms are:

I. All Rooms

1. Satisfactory home economics classrooms are located above the basement and close to the other classrooms in the building.
2. Home economics rooms are located close to each other.
3. Each room is large enough for the number of pupils in the classes and for the successful teaching of the course.
4. Both the natural and artificial lighting are adequate for the needs and come from the proper direction to prevent working in shadows.
5. The ventilating system in the rooms provides plenty of fresh air without the discomfort caused from draughts.
6. The floors are durable, resilient, easily cared for, and attractive.
7. The walls and ceiling are light-colored and easily cleaned.
8. The equipment for each room is adequate for successfully handling the different phases of homemaking to be taught therein, and is well arranged into efficient work units.

The "Appreciation Center" May Be a Picture or a Textile on the Wall, a Bowl on a Bookcase, or a Vase on a Table

Either of These "Appreciation Centers" Would Add Beauty and Charm to Any Home Economics Classroom

TABLE 1

SMALL EQUIPMENT FOR FOODS LABORATORIES

ITEM	MINIMUM					RECOMMENDED				
	Quality	Amount of Equipment for Number of Students				Quality	Amount of Equipment for Number of Students			
		12	16	20	24		12	16	20	24
Dish pan	Enamel	12	16	20	24	Aluminum	12	16	20	24
Bowls (enamel, large)		6	8	10	12		6	8	10	12
Bowls (enamel, medium)		12	16	20	24		12	16	20	24
Bowls (enamel, small)		6	8	10	12		6	8	10	12
Percolator	Aluminum non-electric	3	4	5	6	Good aluminum electric	3	4	5	6
Teapot	Aluminum	3	4	5	6	Nickel-plated aluminum	3	4	5	6
Service plates (enamel)		12	16	20	24		12	16	20	24
Pie pans	Tin	2	3	4	5	Pyrex	3	4	5	6
Pie pans (small)	Tin	12	16	20	24	Aluminum	12	16	20	24
Cake pans (large)	Tin	3	3	3	3	Aluminum	3	4	6	6
Cake pans (small)	Tin	12	16	20	24	Aluminum	12	16	20	24
Bread pans (large)	Tin	2	3	4	4	Pyrex	2	3	4	4
Bread pans (small)	Tin	12	16	20	24	Aluminum	12	16	20	24
Egg beater (Dover center-geared, double-wheeled, large)		6	8	10	12		6	8	10	12
Egg beater (Dover center-geared, double-wheeled, small)		6	8	10	12		6	8	10	12
Egg beater (whisk)		6	8	10	12		6	8	10	12
Measuring cups	Tin	12	16	20	24	Glass	12	16	20	24
Measuring cups						Aluminum	12	16	20	24
Custard cups	Enamel	12	16	20	24	Pyrex	16	20	24	28
Knives	Bone handle	18	18	24	30	Nickel-plated	18	18	24	30
Forks	Bone handle	18	18	24	30	Nickel-plated	18	18	24	30
Teaspoons	Tin	24	30	42	48	Nickel-plated	36	48	48	60
Tablespoons	Tin	12	18	24	24	Nickel-plated	18	24	24	30
Paring knives (stainless steel blade)		12	16	20	24		14	18	22	26
Butcher knife	Steel blade	1	1	1	1	Stainless steel blade	1	1	1	1
Bread knife	Steel blade	1	1	1	2	Stainless steel blade	1	1	2	2
Spatula		12	16	20	24		12	16	20	24
Spoons (wooden, 8-inch handle)		12	16	20	24		12	16	20	24
Strainers (fine mesh)		6	8	10	12		7	9	12	14
Doubler boiler (1-qt. size)	Enamel	6	8	10	12	Stainless steel	6	8	10	12
Kettle (3-qt. size)	Enamel	6	8	10	12	Stainless steel	6	8	10	12
Kettle (8-qt. size)	Enamel	1	1	2	2	Stainless steel	2	2	2	3
Skillets (Russia iron, small)		12	16	20	24		12	16	20	24
Skillets (Russia iron, large, 10-in.)		1	1	1	1		1	1	2	2
Baking dishes (small)	Earthenware	6	8	10	12	Pyrex	6	8	10	12
Baking dishes (medium)	Earthenware	1	1	1	2	Pyrex	3	4	5	6
Muffin pans (medium)	Tin	6	8	10	12	Aluminum	6	8	10	12
Cake coolers		3	3	4	4		3	4	5	6
Brushes (vegetable)		6	8	10	12		12	16	20	24
Brushes (scrub)		6	8	10	12		6	8	10	12
Roaster	Enamel	1	1	1	1	Aluminum	1	1	1	1
Sink strainer		3	4	5	6		3	4	5	6
Cups and saucers	Enamel	12	16	20	24	American ware	16	20	24	30
Plates (American ware)		12	16	20	24		16	20	24	30
Soap dishes		6	8	10	12		6	8	10	12
Egg slicer		1	1	1	1		1	1	1	1
Match boxes		3	4	5	6		3	5	5	6
Bowls (porcelain)		12	16	20	24		12	16	20	24
Rolling-pins		6	8	10	12		6	8	10	12
Bread board		6	8	10	12		6	8	10	12
Biscuit cutter		12	16	20	24		12	16	20	24
Ice-cream freezer		2	2	3	4		3	4	5	6
Lemon squeezer		1	1	1	1		2	2	3	3
Doughnut cutter		6	8	10	12		12	16	20	24
Graters		2	2	3	3		3	4	5	6
Jars (½-pt.)		6	6	6	6		6	6	6	6
Jars (1 pt.)		6	6	6	6		6	6	6	6
Stove brushes		3	4	5	6		3	4	5	6
Dustpan		1	1	1	1		1	1	1	1
Broom		1	1	1	1		1	1	1	1
Food chopper		1	1	2	2		2	2	3	3
Weighing scale		1	1	1	1		1	1	1	1

SMALL EQUIPMENT FOR FOODS LABORATORIES—*Continued*

ITEM	MINIMUM					RECOMMENDED				
	Quality	Amount of Equipment for Number of Students				Quality	Amount of Equipment for Number of Students			
		12	16	20	24		12	16	20	24
Wastebasket		1	1	1	1		1	1	1	1
Tube cake pan		1	1	2	2		2	3	4	4
Glasses—Tumblers		18	18	24	30		18	24	30	40
Salt and pepper shakers	Aluminum	6	8	10	12	China	6	8	10	12
Teakettle (used occasionally)	Enamel	1	1	1	1	Nickel-plated	1	1	2	2
Toaster	Wire	2	2	3	3	Electric	1	1	2	2
Saucepans (1-qt. size)	Aluminum	12	16	20	24	Stainless steel	12	16	20	24
Lids for saucepans		12	16	20	24		12	16	20	24
Lids for kettles		7	9	12	14		8	10	12	15
Flour sifter (small)		6	8	10	12		6	8	10	12
Can opener		1	1	1	1		1	1	2	2
Potato masher		2	2	3	3		3	4	4	4
Knife sharpener		1	1	1	1		1	1	1	1
Garbage pail	Galvanized iron	1	1	1	1	Enamel	1	1	1	1
Potato ricer							6	8	10	12
Baking sheet							2	2	3	3
Oil brush							2	3	4	5
Pressure cooker						Stainless steel	1	1	1	1
Timbale iron							1	1	2	2
Nut cracker							1	2	2	3
Wooden mallet							1	1	1	1
Scissors							1	1	1	1
Ice pick							1	1	1	1
Pastry tube and bag							1	1	1	1
Fireless cooker							1	1	1	1

9. Chairs rather than stools are provided for the pupils for their discussion lessons.
10. The blackboard space is adequate and well arranged in relation to the lighting, so that all can see it plainly.
11. The rooms are cheerful and have a homelike atmosphere.
12. Each room has adequate space for the storage of supplies.

II. FOODS LABORATORY.

1. The room is close to the school lunch room or other rooms used for serving dinners, banquets and other meals.
2. It has a convenient method for the disposal of garbage.
3. There is a plentiful and convenient water supply.
4. There is a heating system in the room other than the cook-stoves. The system is conveniently located and easily regulated, so that it may be used only when needed.
5. The windows and doors of the room are well screened to protect from flies and small insects.
6. The equipment approximates that found in a good home kitchen. It is well arranged for convenience and efficiency in carrying out the activities in the foods course.
7. The foods room is well ventilated, so that odors from cooking food will not permeate the rest of the building.
8. Several electric outlets are provided for the use of various pieces of electric equipment.

TABLE 2

EQUIPMENT FOR CLOTHING LABORATORIES

ITEMS	MINIMUM				RECOMMENDED			
	Amount of Equipment for Number of Students				Amount of Equipment for Number of Students			
	12	16	20	24	12	16	20	24
Sewing machines	3	4	5	6	3	4	5	6
Ironing boards	1	2	2	3	2	2	3	3
Irons (electric)	1	2	2	3	2	2	3	3
Mirror	1	1	1	1	1	1	1	1
Dress form	1	1	1	1	1	1	1	1
Whisk broom	1	1	1	1	1	1	2	2
Yardsticks	6	8	10	12	6	8	10	12
Drafting paper (roll)	1	1	1	1	1	1	1	1
Machine needles (package)	2	2	3	3	3	3	4	4
Shears	1	1	2	2	2	2	3	3
Tapeline	2	2	3	3	2	2	3	3
Sewing needles (package)	2	2	3	3	2	2	3	3
Thread (white and black, No. 50)	2	2	4	4	2	2	4	4
Pins (package)	1	1	1	1	1	1	2	2
Tailor chalk	1	1	1	1	2	2	3	3
Bobbins and shuttles (extra)	3	4	5	6	4	5	6	7
Tracing board					1	1	1	1
Fitting stand					1	1	1	1
Tracing wheel					2	2	3	3
Skirt marker					2	2	3	3
Electric sewing machine					1	1	1	1
Small loom					1	1	1	1

III. Clothing Laboratory

1. The room is supplied with running water.
2. It is so equipped that it may be used for serving meals if no other space is provided. When this is planned, the room should be located adjoining the foods laboratory or kitchen.
3. There are several electric outlets which may be used for irons or electric motors on sewing machines.
4. The equipment is adequate for the successful teaching of the clothing course.
5. A separate room or one corner of the clothing room is equipped for the fitting of garments.

IV. The Bedroom.

1. Simplicity, cleanliness, and a restful atmosphere are the distinguishing characteristics.
2. The equipment is adequate for teaching units on the care of the bedroom and the care of the sick.

TABLE 3

Equipment for Care of Sick

Kind of Equipment	Minimum Amount	Recommended Amount
Bed	1	2*
Mattress	1	2
Springs	1	2
Spring protector	1	4
Mattress protector	1	4
Pillow	2	4
Draw sheet	1	3
Rubber sheet	1	2
Linen sheet	4	8
Pillow cases	4	8
Blanket (cotton)	1	4
Bed spread (cotton)	2	4
Towels (Turkish)	2	4
Towels (face)	2	4
Wash cloths	2	4
Bedside table	1	2
Chair (straight)	1	2
Basin (large)	1	2
Diet tray	1	2
Large pitcher	1	2
Medicine droppers	6	10
Single scale graduate (16 oz.)	1	2
Medicine cabinet (equipped)	1	1
Hot-water bottle	1	2
Syringe	1	3
Bed pan	1	2
Thermometer (mouth)	*	†
Thermometer (rectal)	....	2
Comb	....	2
Brush	....	2
Ice cap	....	2
Nursing bottles	....	‡
Bottle brush	....	1
Eye cup (glass)	....	2
Bucket	....	1
Scales for weighing and measuring	....	1
Chase hospital doll	....	2
Bedside screen	....	2
Manicure set	....	2
Blanket (cotton and wool)	....	2

* Hospital. † One for every two girls. ‡ One of each type.

V. The Dining Room

1. The room is located close to the kitchen, so that meals can be served conveniently.
2. The equipment is adequate for the serving of meals.
3. The room expresses beauty, both in the simple design of the furnishings and in their arrangement.

TABLE 5

Equipment for Serving Meals

Items	Minimum				Recommended			
	Amount of Equipment for Number of Girls				Amount of Equipment for Number of Girls			
	12	16	20	24	12	16	20	24
Linens:								
Tablecloth	2	2	3	3	2	2	3	3
Silence cloth	1	1	1	1	1	1	1	1
Dinner napkins	18	18	24	24	18	18	24	30
Lunch cloth	2	2	3	3	3	3	2	4
Lunch napkins	18	18	24	24	18	18	24	30
Tray cloths	2	2	3	3	3	3	4	4
Centerpiece	2	2	3	3	3	3	4	4
Lunch doilies	....	....	....	....	18	18	24	30
*China:**								
Dinner plates	18	18	24	24	18	18	24	30
Salad plates	18	18	24	24	18	18	24	30
Luncheon plates	18	18	24	24	18	18	24	30
Bread and butter plates	18	18	24	24	18	18	24	30
Dessert plates	18	18	24	24	18	18	24	30
Cups and saucers	18	18	24	24	18	18	24	30
Sauce dishes	18	18	24	24	18	18	24	30
Cereal dishes	12	18	24	24	12	18	24	24
Soup dishes	12	18	24	24	12	18	24	24
Gravy boat	1	1	2	2	1	1	2	2
Platter (small)	1	1	2	2	1	2	2	2
Platter (medium)	1	1	2	2	1	1	2	2
Cream and sugar set	1	1	2	2	2	2	3	3
Serving tray	1	1	2	2	2	2	3	3
Vegetable dishes	2	2	3	3	3	3	4	4
Jelly dish	1	1	2	2	2	2	2	2
Relish dish	1	1	2	2	2	2	2	2
Casserole	1	1	1	1	2	2	2	2
Finger bowls	....	....	....	....	12	18	24	24
Water glasses	18	18	24	24	24	30	48	48
Sherbet dishes	18	18	24	24	18	24	24	30
Silver plate:†								
Butter knife	1	1	2	2	2	2	3	3
Sugar shell	1	1	2	2	2	2	3	3
Dinner knives and forks	18	18	24	24	18	18	24	30
Dessert forks	18	18	24	24	18	18	24	30
Teaspoons	30	36	48	48	30	36	48	54
Salad forks	18	18	24	24	18	18	24	30
Soup spoons	12	18	24	24	18	18	24	24
Butter spreaders	12	18	24	24	18	18	24	30
Tablespoons	2	2	3	3	3	3	4	4
Gravy ladle	1	1	2	2	1	1	2	2
Meat fork	1	1	1	1	1	1	1	1
Carving set	1	1	1	1	1	1	1	1
Miscellaneous:								
Salad fork and spoon (wood)	1	1	1	1	1	1	1	1
Salt and pepper shakers	3	4	5	6	4	5	6	7
Water pitcher	1	1	1	1	1	1	2	2
Tea wagon	....	....	....	....	1	1	1	1
Flower bowl	1	1	1	1	2	3	3	3
Flower vase	1	1	1	1	2	3	3	3
Additional:								
Ice tea glasses	....	....	....	....	18	18	24	30
Ice tea spoons	....	....	....	....	18	18	24	30
Dessert spoons	....	....	....	....	18	18	24	30
Punch bowl	....	....	....	....	1	1	1	1
Punch cups	....	....	....	....	24	36	36	48

* Min.: — Inexpensive American ware
Rec.:—Good American or English ware
† Min.:—Monometal
Rec.:—50-yr. guarantee

VI. The Laundry Room

1. The finish on the walls is such that it is not harmed by moisture and can be easily cleaned.
2. The floor is not injured by water.
3. Several well-insulated electric outlets are provided for the attachment of washing machines and irons.
4. The room is well ventilated, so that clothes will dry quickly.
5. The equipment is sufficient for the teaching of the laundry activities and is well arranged.

TABLE 6

Equipment for a Laundry Room

Items	Minimum Amount	Recommended Amount
Washing machine	1 (borrow from a store)	1 (electric desirable)
Tubs (stationary or on standards)	2	2
Wringer	1	1
Boiler	1	1
Clothes basket	1	1
Clothes stick	1	1
Washboard	1	1
Clothespins	4 doz.	4 doz.
Clothes drier	1	1
Ironing board	1 (from sewing room)	1
Iron	1 (from sewing room)	1 (electric)

Common Faults

Faults commonly found in home economics classrooms may be divided into three groups.

The first are those found in the room itself. These are due to the installing of home economics in old buildings not originally designed for this work, or to poor planning of new buildings. Chief among these are inadequate storage space, no provision for discussion lessons, poor light and ventilation, and a great distance between the foods laboratory and the room used for serving meals.

The second group are those found in the equipment itself: its size, material construction, or inadequacy. Some of the most frequent of these are:

1. There is often a lack of well-selected illustrative material.
2. Many schools have foods desks with stool attached. Such a stool furnishes a poor standard and makes it hard for the student to maintain a correct posture.
3. There is frequently much useless small equipment in the foods room, such as large, heavy, wooden spoons and standard-size bread pans with removable bottoms, which make it impossible to use them for anything else.
4. Small individual electric hot plates or gas burners are often the chief means of cooking. Electric hot plates are hard to repair, and no small individual heating device is durable or in keeping with good home standards and practices.
5. Inadequate oven space is a serious fault. Many schools provide only one oven for the entire class to use. It is impossible for all the students to have satisfactory baking results under such crowded conditions.
6. Insufficient equipment prohibits effective teaching of all the units of the course. The lack of equipment is usually most noticeable in teaching the units in care of the sick, care of children, laundering, related general science and art, textiles, and serving of meals.

The third group are those due to poor arrangement of equipment. In many schools, little or no attention has been paid to whether the arrangement is such that steps will be saved in obtaining supplies and in doing one's work. Consideration is seldom given to the fact that right-handed people work most efficiently with a right-to-left movement, and that time and motions will be saved if the equipment is arranged so that activities can be carried on in a right-to-left order.

Care should be taken in equipping home economics classrooms that these faults as well as others that prevent good teaching of home economics be eliminated.

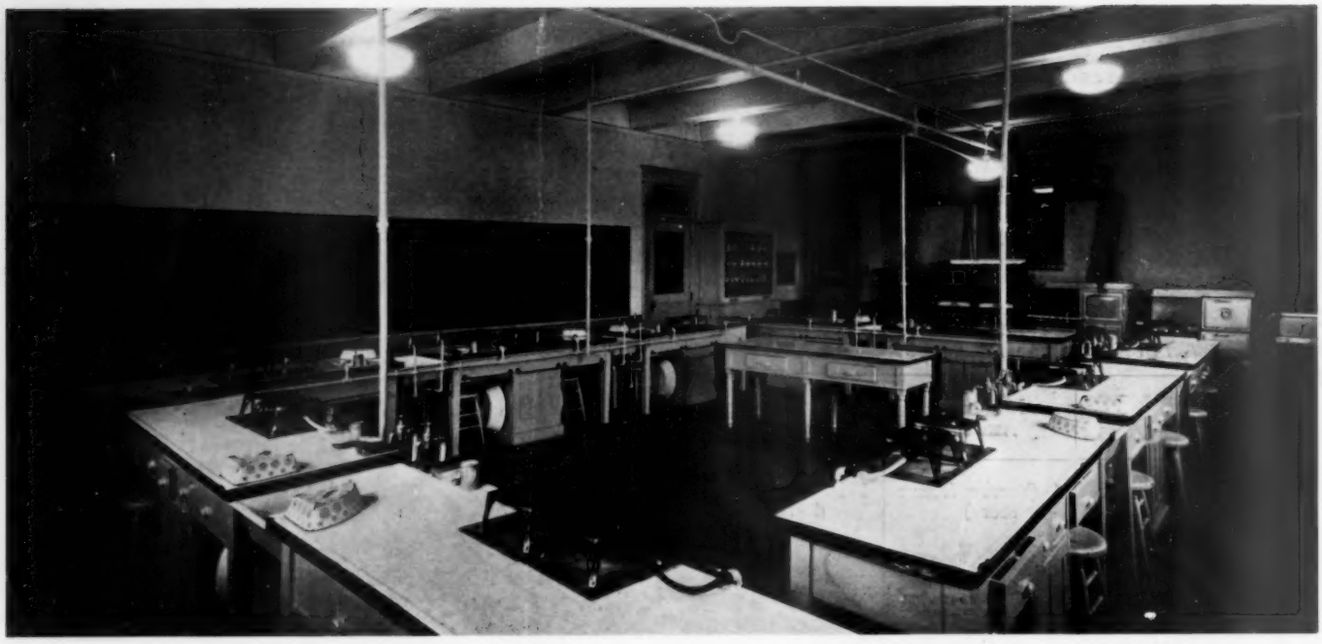
Size of Classrooms

The size of home economics classrooms is important and depends upon the number of work units to be taught in each room and on the number of students to be accommodated. Separate rooms for the teaching of clothing, foods and meal service can be smaller than if only one room was provided for all phases of home economics. Classrooms with more pupils than can be properly taught under the existing conditions are most undesirable.

TABLE 7

Suggested Room Sizes

Number of Rooms Used for Home Economics	Size of Rooms for Following Number of Students			
	12	16	20	24
	Feet	Feet	Feet	Feet
One Room (Foods, meal preparation and serving, care of home, care of sick, care of children, laundry, clothing, fitting, storage	20 x 30	22 x 36	24 x 36	28 x 40
Two Rooms	20 x 30	22 x 36	22 x 36	24 x 36
1. *Foods* (foods, meal preparation and serving, care of home laundry, storage)				
2. *Clothing* (clothing, fitting, care of sick, care of children)	20 x 30	22 x 30	22 x 36	24 x 36
Three Rooms or More	16 x 24	20 x 30	22 x 30	24 x 36
1. *Foods* (foods, laundry, care of home)				
2. *Clothing* (clothing, fitting, child care, care of sick, storage)	16 x 24	20 x 30	22 x 30	24 x 36
3. *Dining room* (meal serving)	14 x 16	14 x 16	14 x 16	14 x 16
4. Storage room	6 x 8	6 x 8	6 x 8	6 x 8
Home Economics Cottage				
1. Foods laboratory	16 x 24	20 x 30	24 x 30	24 x 36
2. Kitchen	12 x 14	12 x 14	12 x 14	12 x 14
3. Dining room	14 x 16	14 x 16	14 x 16	14 x 16
4. Clothing laboratory	16 x 24	20 x 30	24 x 30	24 x 36
5. Bedroom	14 x 16	14 x 16	14 x 16	14 x 16
6. Bathroom	6 x 10	6 x 10	6 x 10	6 x 10
7. Fitting room	6 x 8	6 x 8	6 x 8	6 x 8
8. Storage room	6 x 8	6 x 8	6 x 8	6 x 8



The Former Hollow-Square Arrangement, Kansas State College

Equipment

Equipment for home economics classrooms should be sturdy, well constructed and durable. That which is cheap, flimsy and poorly made has small place in the classroom, and ultimately is the most expensive. School equipment receives extremely hard use, and only that of good quality can withstand the wear and strain placed upon it. This applies to all equipment, both large and small. However, its choice should be in keeping with standards possible in the homes of the community.

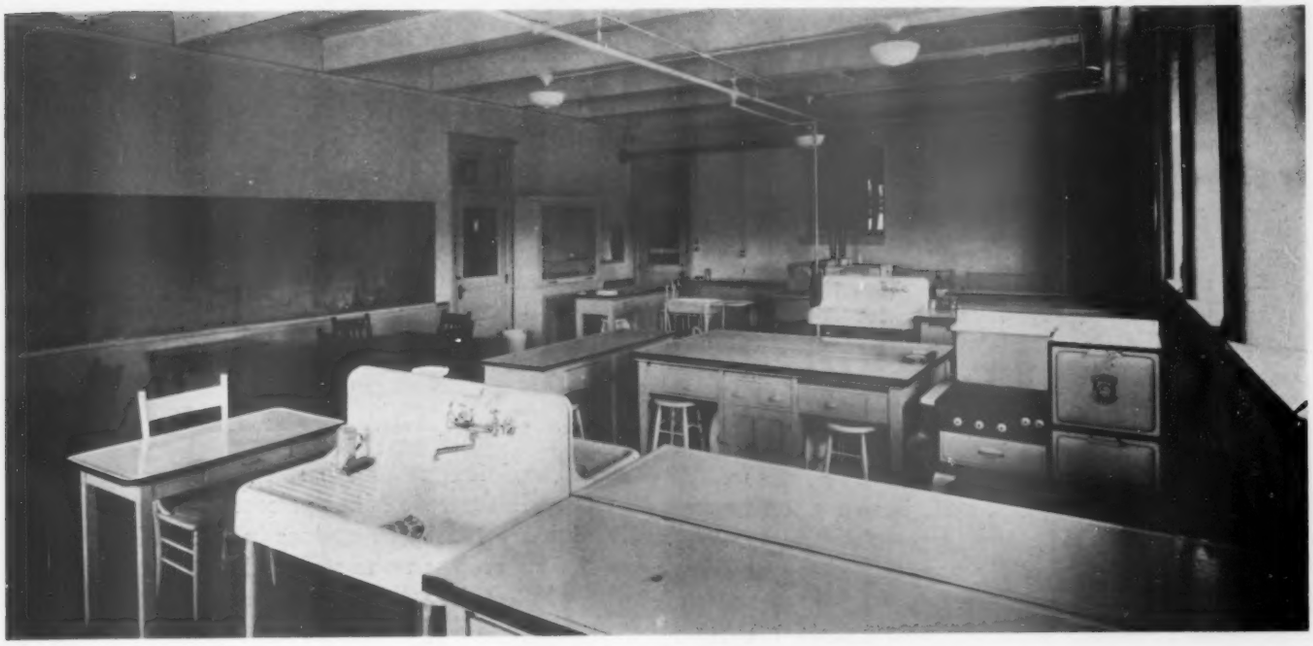
The outstanding trend in the selection and arrangement of all home economics classrooms is to feature home conditions as nearly as possible. This has resulted in the unit plan of arrangement and the selection of equipment similar to that found in the home. Unit arrangement enables pupils to work together in groups typical of those in the home. The parallel row, unit desk, and unit kitchen arrangements are all variations in the unit plan, the unit kitchen being considered the best.

In the unit plan of arrangement a unit represents, in some form, a kitchen and dinette. In it are needed a work table, a stove or range, *not a hot plate*, a sink, a kitchen cabinet, a work stool, a dining table and chairs. Some of these can be combined in one piece; for example, the work table and dining table. One manufacturer has recently combined the work table and cabinet. He has done this in such a way that the piece of furniture is somewhat like a buffet in appearance.

Frequently the units in a laboratory are each equipped with a different type of equipment. Then the pupils are rotated in their use of the units. By this means the pupils become familiar with many different types of equipment and can judge for themselves the qualities of a given piece.

Some schools, in their attempt to carry out the "home idea," have equipped their home economics classrooms with regular home furniture. Though satisfactory for such rooms as the living room, bathroom or home dining room, the plan has not proved altogether desirable for class laboratories. Home furniture is not so sturdy and substantial as is needed for school classrooms and has not always withstood the wear and use given it. The need is for laboratory furniture that has the appearance of home furniture and also the strength and wearing qualities of the former laboratory equipment. Another needed piece of equipment is a stove that is in reality a small-sized home range. The swinging stool should no longer be used, but a real kitchen work stool or chair should be provided. Regular kitchen sinks are made, and many schools have installed them for each unit, or sometimes in such a way as to serve for two groups. The old hollow square type of arrangement is entirely out of date.

Too often it is assumed that only when building a new school can there be new equipment or this unit plan of arrangement installed. This is not the case, for an old laboratory can be made over and modernized relatively easily. It is true that the plumbing in a room generally offers a problem both in convenience and expense. However, usually through careful study of the size and shape of the room, an improvement in arrangement can be secured even with the same plumbing system and little or no new equipment. Such an

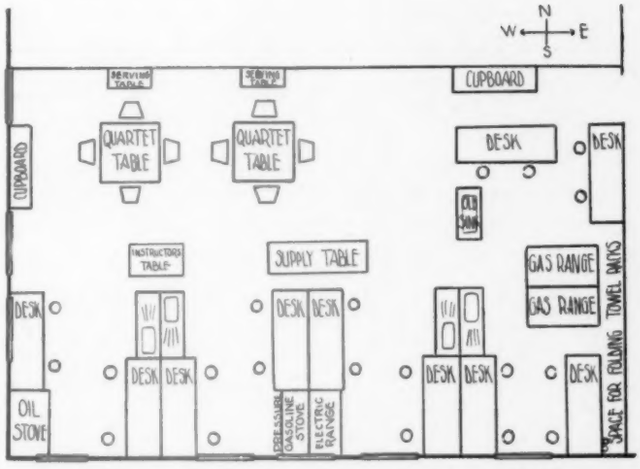


The Same Laboratory Rearranged into Unit Kitchens by Dr. Martha Kramer

accomplishment was made at Kansas State College by Dr. Martha Kramer. With practically no change in the plumbing, she converted a hollow square arrangement into unit kitchens. In one kitchen an old sink was used, and for the others new sinks were purchased. By the new arrangement sufficient space was secured for two dining centers or dinettes. In rooms where the plumbing is not a problem, rearrangement usually becomes a simple matter.

The Importance of Modernizing Laboratories

Here, in re-working laboratories, to my mind, is the greatest opportunity in the development of properly equipped laboratories. To wait until there is a new building only delays effective teaching of home economics. Numerous laboratories everywhere need making over and modernizing. Home economics teachers in most instances could improve their equipment in some way. They should cease to be "long-suffering" and become alert to possibilities of improvement of teaching through the improvement of their equipment. Too often, antiquated equipment means antiquated teaching.



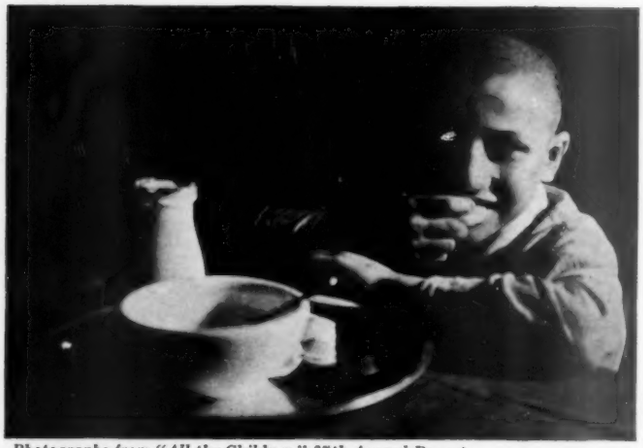
Floor Plan of Unit Kitchens as Shown in Photograph Above

The planning and equipping of home economics classrooms has a distinct educational aspect, beyond the securing of tools for work. Through the use of the right type of equipment, the proper skills, standards and attitudes in homemaking are developed and a worthy contribution is made toward the improvement of home and family life.

SANITARY PROVISIONS IN FOOD HANDLING

BY JOSEPHINE ADAMS

Operating Manager, School Lunches, Home Making Division, Board of Education, New York City



Photographs from "All the Children," 37th Annual Report of the Superintendent of Schools, City of New York.

SANITARY provisions in food handling are among the most important problems which must be met by any concern serving food to the public. Boards of health in city, county and state have set forth regulations concerning the storage, preparation and service of food, but constant daily supervision and care are of paramount importance.

The observations made in this article are from experience obtained largely in school cafeterias. The sanitary conditions in the school or college cafeteria should be so patently good that students will demand the same high standards in commercial cafeterias.

Customers' Clean Hands Are of Paramount Importance

Before saying anything further on this subject I must make myself clear: It is all very well to have a beautifully equipped and managed cafeteria in an educational center, but have the school authorities provided adequate facilities for each student to properly wash his or her hands in hot water, with soap, to properly rinse them and properly dry them on sanitary towels? It is a not uncommon occurrence in schools for the students to go to the cafeteria directly from the classroom or toilet, there being no provisions for ordinary cleanliness. All the sanitary regulations in the world are a mockery if the students' hands are nests of germ life.

However, let us take for granted that the hands of each customer of the cafeteria are clean. What are the salient points which must be reached in making sanitary the conditions under which the food is prepared and served?

Check Sources of Food Supply

The first important step in sanitary control is to check the source of the food supply. Visit the market, the warehouse, the store from which you expect to receive food materials. Note the physical appearance of the building itself, the employees, the toilet facilities and washrooms. Judge accordingly. This is an educational feature of school cafeteria management, because if the cafeteria representative would refuse to purchase food from sources in which the sanitary conditions are not up to standard, and would frankly say why, such action would reach the formidable weapon, public opinion, and reforms would certainly be forthcoming. As an example of this: A certain restaurant chain received a bid for a staple food article which was much lower than that of the nearest bidder. The company chemist was sent to see the type of factory and general sanitary conditions which prevailed. He came back without entering the building and reported, "Dirty windows, dirty entrance steps, dirty sidewalk, and disgraceful garbage cans on the sidewalk." The next highest bidder, well known for cleanliness, received the contract.

The Food Storeroom

The storeroom in the school or college cafeteria is often neglected. It should be in a cool location and should be provided with adequate outside ventilation, proper window screening, and metal storage shelves. No food should be left in burlap, cotton, paper, wood or cardboard containers. Candy and crackers should be stored in a metal cupboard. Many devices have been made for storing foods, yet the cheapest and most satisfactory containers are the ordinary galvanized iron garbage and ash cans with tightly fitted covers. These come in a variety of sizes and are easily handled. Mice, rats, roaches and flies find nothing on which to feed if these precautions are taken. Another means of keeping the storeroom free from pests is to avoid the use, from May or June to October or November, of foods which spoil easily, foods such as barley and cereals, except those purchased in small quantities as required in the daily recipes. Also, purchase in weekly lots the vegetables which mold, rot or sprout easily, and thus avoid unnecessary waste. These vegetables should be screened with fine wire netting so that the ordinary food pests cannot feast upon them.

Nothing except food materials, canned, bottled, dried or raw, should be housed in the food storeroom.

Adequate Refrigeration Necessary

One of the greatest factors in maintaining a sanitary kitchen is adequate refrigeration. Moreover, if the refrigerator is adequate, it saves time and money. There is no cheap route to adequate refrigeration, for the best is none too good when the students' interests are at stake. However, whether it be iced or mechanical refrigeration, constant vigilance is required to be sure that no food deteriorates during storage. Daily inspection and care are essential. Covered storage pans are desirable, but a bowl or pan tightly covered with waxed or parchment paper is satisfactory. Food should be at room temperature before being placed in the refrigerator. The regular defrosting of the mechanical refrigerator and the scrupulous cleansing of the drain pipe and drip-pan in the ice refrigerator are just as important as the proper cleansing of the hands, and need no further comment.

Necessary Precautions in Preparing and Serving Food

During the preparation of the food, all waste food must be disposed of at once, leaving the work tables, sinks and drains clear at all times.

Large equipment (mixing and slicing machines, potato peeler and vegetable cuber, cocoa urn, steam table parts, large pots, etc.) should be cleaned immediately after using.

Food or liquid spilled on the floor and tables should be wiped up immediately.

The floor must never be swept while food is being prepared nor when any food is on the counter.

Foods ready for the counter should be set up at the latest possible time to avoid undue exposure. In localities where the presence of flies is trying, the first thing to be done is of course to carefully screen all windows and exits. No objection can be made to sticky fly paper, provided it is removed before the service begins. Many objections to this fly paper are not based on scientific reasons.

Avoid having empty cartons, boxes, papers and wrappings around the counter. These should be placed at once in the receptacles provided for their disposal.

In the dining room, covered receptacles should be placed about the cafeteria for the disposal of empty sealcones, straws, dixie cups, papers and bags. No waste food materials should be placed in these receptacles, which are for the particular convenience of those who bring lunch from home.

Garbage cans should be neatly lined with newspaper and kept covered. After being emptied, they should be scrubbed with a hot soda solution, rinsed, and dried in the open air when possible.

Dishwashing

Each part of the dishwashing process has its own sanitary regulations, which must be constantly observed.

Clean dishes wiped with a towel far from clean, and put into closets which smell far from fresh, show a lack of sanitary supervision.

The problem of dishwashing is simplified if a modern dishwashing machine is part of the equipment. But even here great care must be observed so that one part of the process does not laugh at another. For example, I have seen an employee in charge of the machine stack plates on which fish has been served, then place the plates in the racks, operate the machine, and take out the clean plates without washing his or her hands.

When a mechanical dishwasher is out of the question, the same procedure used in getting the dishes and silver ready for the dishwasher should be followed preparatory to washing by hand: plates scraped to remove all food or waste remnants, piled according to size; cups and glasses drained; forks, knives, spoons sorted. All should be washed in hot, soapy water, rinsed in hot, clear water, drained and dried. It is a rule in New York City that cups, spoons and forks must be boiled after the regulation washing and rinsing for at least ten minutes. When one considers that 92,605 emergency lunches alone are prepared and served daily in New York City, it is clear that anything short of this precaution is culpable. The method of drying dishes is an individual one; in some instances it is preferable to drain the dishes without towel drying. The main thing is, are the dishes and silver clean when put away? Were the towels used clean?

China should be inspected daily and all cracked pieces discarded. In addition to the possibility of food decomposition in cracks, there is the danger of the plate, bowl or cup breaking while being used by the pupil.

Proper Care and Storage of Cleaning Equipment

The care of dish towels, dish cloths and floor cloths is an imperative one. In elementary and junior high school cafeterias regulations in New York City require that in the dishwashing room and in the kitchen proper, a pail of hot water must be provided to which soap powder or soap solution has been added, into which soiled towels, house cloths, etc., may be placed to soak. At the proper time these are washed, rinsed, boiled and hung to dry, and the thorough soaking does away with the unsightly habit of leaving half-soiled towels and house cloths on tables or sink.

Adequate space should be provided for brooms, mops, house cloths, etc., but unfortunately we seldom find provision for this important sanitary feature of a cafeteria. The most satisfactory housing of this equipment is in a separate room with outside ventilation, metal shelving, ample sink with wringer, hot and cold water supply, single or twin tubs for washing and rinsing towels and house cloths; ceiling dryers, metal rack on which to hang brooms, brushes and mops; metal shelves for scrubbing brushes, pails, cleansing powders, ammonia, etc., and adequate space for drying bars of soap. If it is not possible to give space to a room of this type, a large closet should be provided which can easily be lined with tin, and the ventilation spaces screened with ordinary wire screening. Whenever possible, scrubbing brushes and mops should be dried in the open air. Many object to the use of mops because they are difficult to keep sweet and clean, while to many the mop is a necessity.

In an ideal cleaning-equipment room, nothing should rest on the floor, and no disinfectants should be used. The latter will not be necessary if an abundant hot water supply and ordinary household cleansing materials are furnished.

Assuring Cleanliness on the Part of Employees

What about the cooks and helpers themselves? Could anything be more unpleasant than to find a hair in soup, or to know that the food was prepared by a person who could not pass a real health examination? Yet these are situations which we face daily and which must be regulated and controlled, because human beings themselves are great carriers of disease. All employees should be given a physician's examination.

Employees cannot be expected to have clean personal habits during their cafeteria hours unless proper facilities are afforded them. Adequate dressing rooms, metal clothes lockers, hot and cold water, liquid or cake soap, proper towels and mirrors must be provided.

Although these provisions will leave no excuse for not following sanitary regulations, vigilance must continue after the employees enter the preparation and serving floors. A sanitary washstand should be provided in kitchen and service room or pantry, equipped preferably with liquid soap and paper toweling. Naturally, the latter are a financial impossibility in many schools, but in that case the sink or tub and soap in each kitchen can be used. Each employee can have his or her own hand towel attached to the apron.

Even this is not enough. Hands should be washed under supervision before the employee is permitted to start to work, for experience has shown that the aversion of the small child to proper washing of the hands carries over perfectly in many adults, particu-

larly those who have received no instruction in the science of cleanliness.

I will quote a few of our regulations to employees:

Never use any but your own hand towel or paper towel.

Smoking by either men or women is not permitted during hours on duty, either on the preparation floor, in the locker rooms or toilets.

All employees must maintain the highest standard of personal cleanliness.

Clean aprons and caps must be worn at all times while on duty. Women are to wear hair nets in addition to caps, so that no stray hair is in evidence; men, the regulation hat.

The hands of the employee in food preparation must be clean. This includes the finger nails. Women: do not use highly colored nail polish, lipstick, excess of rouge. Do not wear jewelry.

Do not wear a sweater under the regulation uniform or apron.

A Question

Again and again we are faced with this question: Of what material shall the walls, ceiling and floors be made? The answer to this question in the light of present knowledge will be superseded by a better answer tomorrow. Therefore, no attempt is made here to offer any suggestion except to state that school cafeterias should be fireproof, easily cleaned, easily ventilated, well lighted, and have proper facilities for personal hygiene and cleanliness of employees and pupils.

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RECENT PERSONNEL PROBLEMS OF EDUCATIONAL INSTITUTIONS

BY ETTA H. HANDY

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THE employee organization in a school or college food service or food and housing service is not only designed to perform a definite function in the educational project; it is also a human organization in which the aspirations and abilities of the individual workers find expression. In this organization the dietitian or manager has two objectives: to conduct her enterprise to meet the business, social and educational requirements according to the policies of the institution; and to guide the work of the individual employee and the coordinate group effort toward a common and clearly defined goal in which all are interested.

Economic conditions of the last few years have brought new problems in public demands and have intensified the psychological or emotional factors affecting the work and attitude of the employee. The more successful management of employees has always depended upon an unusual degree of sensitivity and consciousness in human relations on the part of the supervisor, to establish sound and progressive principles. This skill in the handling of employees is, to a high degree, innate and intuitive in the individual, but it may be further developed through experience and a realization of the necessity for adapting former methods to the fast-changing conditions of the present.

A consideration of these newer factors in employee supervision presents a challenge to intelligent, constructive leadership in management. It may be of

value to analyze a few of the aspects of these employee-manager relations to determine the extent to which the methods of management in any given institution have been adapted to the conditions now found among employees. Among these factors are: the manner of selecting employees; the manager's interviews with employees; the importance of continuous training; the development of an esprit de corps as a result of correct organization; and the promotion of working conditions and regulations that give employees a certain economic satisfaction.

Manner of Selecting Employees

Care in the selection, training and advancement of employees will minimize the problem of friction in employee relations and inefficiency in the conduct of work. It is usually possible to avoid the irritation often engendered by introducing into the group a worker who from the very beginning may be lacking in ability to do the work well, or whose instability of temperament, emotional weakness or personal peculiarity would interfere with establishing pleasant human relationships with his fellow workers. Certain aptitudes or skills are definite requirements in any work, but the neatness, cleanliness and appearance of the worker; his attitude, intelligence, temperament and physical health; the personal qualities of loyalty, steadfastness and honesty, are also valuable contributions to a generally favorable atmosphere. These factors are important in the larger groups of workers and merit increased emphasis in the small unit where every irritating personality is the more damaging to the general tone of the group. Current scientific research in the personnel field may be sensibly and profitably applied in dealing with such practical situations.

Regardless of the size of the department, the responsible manager will analyze the jobs in the working force in advance, to avoid misfits. The typical job analysis pictures the conditions or factors, and the requirements affecting each worker, in a condensed form. The logical sequence of the job in relation to others in the department is also considered, in order that the new employee may be of the right type to be promoted directly in the same type of job, to be given increased responsibility, or to be transferred with a higher wage scale to another division. A detailed plan for each employee and a broad general plan for each department are essential to smooth performance. Unless the organization is studied down to a very fine point and correctly planned and provided for, there is inevitable friction, or an employee may not be placed where he can accomplish the most work, or the wrong person may even be assigned to the task to be done.

The vicissitudes of the last few years have brought a high type of individual applying for even the more lowly jobs. If such an employee is sufficiently adaptable, the organization gains by the addition. Nevertheless, if the employee of this higher type is maladjusted, he becomes dissatisfied and restless, and his work may be less well done. The fact remains that the duties of the position must be correctly performed and its obligations fulfilled. The personal feeling and attitude of the worker must be adjusted to the job in such a way that he fully accepts the situation and performs the duties correctly and with the right spirit.

At the other extreme is that employee who may be able to perform the duties of a minor position satisfactorily, but whose qualifications are so limited that he cannot rise above that level. In the larger organization it may be possible to maintain such an individual in a less important position for a considerable period of time. However, the difficulties of the small organization are increased if the individual employee cannot rise to an emergency or be rotated around to other duties or qualify for promotion.

Preliminary Interviews with Employees

Another aspect in the more recent problems of employee relations is that of the approach to the new applicant for employment through the interview. If the manager can be at ease and deal with the questions raised with quiet, unhurried assurance, it will tend to break down any tension or nervousness on the part of the prospective employee. Questions asked during such an interview may indicate some subject of interest to both, such as a former employee, some locality, or other employees, that may be used as a talking point to relieve any embarrassment on the part of the applicant. Further light on the applicant's background, temperament or emotional stability may be gained from learning something of his recreations or social activities and his use of leisure time. This may help indicate to what extent the applicant's morale has been affected, if at all, by his experiences of the last few years. These are some of the intangible influences which surround the manager in relation to employees, and more time is required than formerly in weighing such factors, and determining their possible effect in the organization.

Medical examinations for all food handlers are required by some city ordinances or state laws, and are valuable aids in relation to positions not directly connected with food. When such examinations are required by the institution, physical weaknesses, defective vision or hearing, or communicable disease will be detected. They will indicate the applicant who should not be assigned to certain jobs, and occa-

sionally an individual who should not be employed in a particular position. Usually an applicant will not object to the prospect of an examination. If objections are raised, the applicant is probably conscious of some weakness or defect that would make him undesirable.

The Exit Interview

Of equal importance to the preliminary interview is the exit interview when the employee leaves his job voluntarily or involuntarily. In either case the facts should be recorded, and later reference to them will demonstrate whether an employee is worthy of rehiring or can be used as an extra in an emergency. If there has been irritation or a frequent change in any one position, a thorough talk with the employee on leaving may reveal conditions not easily visible or not anticipated and resulting in friction or too great turnover. The information will aid the manager in correcting any detail of faulty organization. It is of great value to the institution to have an employee leave with good-will toward it. If he does not have the capacity, or has failed to meet the requirements of the job or to work in harmony with other employees, he may be so informed in kindly fashion and helped to another position elsewhere for which he can qualify. There are really few offenses that send an employee out without a cheering word or assistance in another direction. Occasionally a manager may transfer an employee to another department, or change the job successfully, to avoid dismissal. At other times it is wise to dismiss an employee without delay.

Continuous Training of Employees

Ever-increasing emphasis is being placed on training the employee as a means of more effective service, and of prevention of the expense involved in changes, and as a strong factor in promoting good-will on the part of the employee. The higher percentage of turnover is found among new employees who become dissatisfied or discouraged, or fail to adjust themselves to the demands of a new position. The manager should provide the new employee with the information necessary to aid him to adapt himself readily to his job, and should make the introductions to other employees in such a way that he will feel quickly at home in his group. Instructions as to the general rules of conduct for all employees and any specific regulations in a particular job may be given verbally or by written notices, or by an employees' handbook for further reference and study. In this way duties as well as relations to others are clearly defined. Sometimes a new worker may be placed under the sponsorship of another responsible employee for preliminary training.

After an employee has had a few days in which to orient himself, it is well to talk over his duties and experiences to make sure he is performing his work satisfactorily and understands clearly what is expected of him in all his relations. A similar check may be placed on performance by another interview a few weeks later. Employees require training in little as well as big things. If sound principles are established and right methods are inculcated, the results will be good. The staff organization must be kept flexible to meet constantly changing conditions in our economic world. As in selection, more time is required in training the new employee than formerly.

Building Esprit de Corps

In this matter of training and group handling, a manager assumes the viewpoint of a teacher in adult education. The individual approach in initiating training gives an opportunity to stimulate enthusiasm and build up a similar attitude in co-workers, to develop independence, self-help and self-reliance on the part of the workers in studying the requirements of the job. Open group discussions are also valuable, since they may invite suggestions for improvement, a discussion or criticism of results, or an analysis of methods likely to produce good results. These are all aids in determining internal policies and are vital in group dealings.

Likewise, rules and regulations to improve working conditions help develop a right spirit and attitude if correctly adjusted to the organization. Employee benefits, shower rooms, suitable rest rooms and smoking rooms are important aids to a happy frame of mind in the employee, and incentives to good work.

The Employees' Economic Satisfaction

While job analysis and job sequence are a positive aid and a protection to the professional staff, there are other basic reasons underlying the use of those methods. Closely related to the response of the employee to a carefully planned introduction and systematic training in his new job is his sense of satisfaction in the personal economic factors involved; such as the successful performance of duties, recognition of good work, a feeling of security in steady, faithful employment, reasonable wage scales, and fair, understanding supervision. Changing conditions in the economic world have served to intensify the worker's need and desire for these satisfactions. Any employee enjoys his work keenly if he feels it is well done according to its requirements and his abilities, and that he fills a need and is an essential part of an organization. Institutions and many forms of food service can offer continuity of work far beyond the average industrial or office employment. Moreover, a well-organized department makes it possible for an

employee to find his natural level through such orderly promotion as he may deserve, and thus satisfy more fully the requirement for permanent sense of security and the gratification of his personal aims.

Wages are an important element in employee satisfaction. He likes to feel that his scale is equal to that of others with similar duties in the same or other organizations. Earnings are inevitably a chief objective, and as a practical matter the basis for wages in any position is the prevailing rate of the community and according to the law of supply and demand. In minor positions there is usually no lack of applicants sufficiently qualified who may be engaged. In positions which require definite skills or which are more difficult, there may be few applicants qualified, and it may be necessary to pay well to fill the position. Given the favorable factors which invite the personal interest of the employee and tend most to his economic satisfaction, such as good environmental working conditions, equipment facilities for good work, fair hours, management which inspires his respect and confidence, and continuity of work, it is possible to keep wage scales at moderate levels consistent with the prevailing rate of the community and still develop high group morale. If these elements underlying employee satisfaction are not up to the average in one or more particulars, it may be necessary to raise the wage scale in order to maintain a qualified staff.

The manager who gives thought to the employee in all these relations, and is able to develop high individual efficiency through happy satisfaction of the worker, will increase group production and create an atmosphere and tone in the organization of definite value. It is good business practice to pay as high wages as the income may justify in order to secure the right type of employee qualified for the respective job.

In connection with wages there is the matter of meal allowance to be determined. The best results are usually secured if wages can be paid irrespective of room or board, but some institutions cannot follow such a plan, owing to internal conditions. When meals are served to employees, they should be of good standard, adapted to the employees' needs and served in simple, attractive form. Employees' dissatisfaction with meals is quickly reflected in work, and it pays to make suitable arrangements for reasonable employee service of good standard.

Such practical phases contributing to employee attitude and group atmosphere are almost inseparable from those we term morale and discipline. The latter are indefinable attributes and yet are positive factors, presenting a continuous daily problem for the manager. Morale is based on loyal cooperation between individual workers, and between workers and management, in a determination to carry forward in a common cause. In fine, it is the esprit de corps of the organization. Discipline, on the other hand, functions to maintain correct performance of duties and proper conduct on the part of the individual and the group. There is necessarily a certain degree of strictness of discipline, although it should never be apparent but, rather, an unseen force. The habit of suggesting rather than ordering is plainly the best way to get work done. Employee training must include the reason why, as well as instruction in approved method. However kindly, just and tolerant, the manager must make it clear that work must be well done and when so accomplished will receive recognition. Careless or neglectful work merits reproof and should receive it.

Special allowance must often be made these days for emotional upsets or disturbances of the worker due to outside factors in his environment, such as conflict or anxiety in his home or unusual adversity. A temporary lowering of the standard of work may come as a result of some lowering of physical efficiency or allowing the mind to wander in worry rather than deliberate intent of the employee. Only a close personal knowledge on the part of the manager will detect such difficulties and indicate the amount of special consideration a valuable employee is entitled to receive at such times.

If there is an intelligent understanding on the part of the worker as to duties, the manner of their performance and his own relations to others, he will do good work because of his own inner desire rather than from any sense of compulsion. The sense of discipline in an organization becomes then unobtrusive and almost automatic. Responsibility for this inspirational type of leadership on the part of management is opposed to the old-time idea of a more-or-less military attitude toward the group-handling of employees who accepted commands given because of their necessity to earn.

It is obvious that consideration of these several aspects in our recent personnel problems implies a breadth of viewpoint, vision and a certain philosophy of management as well as a study of the newer techniques of control. The manager who can most successfully weigh and interpret the effect of these factors and influences, and solve them in relation to a particular group of workers, will have a valuable asset in developing a high degree of initiative, efficiency and fine morale in the organization.

MARY MAYO HALL AT MICHIGAN STATE COLLEGE

A Successful Self-Liquidating College Dormitory

BY ALEX. L. TROUT

Architect, Detroit, Mich.

EIGHT years have passed since the Governor of Michigan vetoed an appropriation for a dormitory for Michigan State College. He made the suggestion that he felt the state should be responsible for education, but that the housing of college students could easily be on a self-sustaining basis. This thought was favorably received by the governing body of the college, who carefully worked up the details and plans for the building. Mary Mayo Hall, the outcome of this thought, is the subject of our article.

Five years of successful operation through a depression period have demonstrated the soundness of the plan. All costs except land and utility extensions were met by issuing bonds. While the bonds are payable from income only, and are not a state obligation, they are selling today at the call price, with few offerings. When certain legal difficulties are overcome, the College will continue to expand these facilities on a similar basis.

Because of the varying factors that affect dormitory costs, we are not going to discuss business statements in great detail, but will rather emphasize certain general aspects of dormitory planning and management. After all, the financial management is merely a means to a desirable end—namely, that the dormitory building may contribute to a more efficient and satisfying college life.

A Socially Satisfactory Dormitory Is Financially Stable

A college dormitory is only a specialized type of housing. As compared with ordinary housing, it has certain distinct advantages and disadvantages in its financial aspects. It houses young people from widely varying social and economic backgrounds. It seeks to make their group living helpful and enjoyable. Perhaps the most valuable contribution of the self-liquidating idea has been a careful weighing of all objectives, and a pointing of the way to new economies and greater efficiency.

Modern thought demands certain practical requirements in the college dormitory. First of all, it should be fireproof. The cottage type is possibly an exception. But where available space is limited or minimum travel required, a three-story building housing a goodly number of students should be fireproof. This

will add to the cost of the building approximately one-quarter, but it will add to its life length and reduce the cost of maintenance and repairs. It will make a quieter building—a consideration that should not be forgotten, particularly in buildings of the corridor type. Reduced insurance will help offset increased cost. Because of the low current rates of interest, none but fireproof buildings should be considered.

Having decided on the type of the building construction, the size of the social unit next requires consideration. Mary Mayo Hall houses 246 girls. They are divided into two distinct social groups, each with its own house mother or director. One kitchen serves for both groups, but separate serving and dining rooms, parlors and recreation quarters are maintained. This arrangement adds slightly to the operating costs and to the initial cost of the building, but has advantages from the viewpoint of social control. While a group of 120 girls is fairly large for one social director, it has not proved unwieldy.

After the question of the size of the social unit, the next problem in dormitory planning is the question of the individual room or suite. Practically all buildings of the self-liquidating type are designed with double rooms. Compared with single rooms, the cost per occupant is materially reduced by this arrangement. For freshmen the plan works well. Upper classmen prefer quiet, and for them single rooms are recommended. Where double rooms prevail, a number of group study rooms should be available, so that the student who is working late will not disturb his roommate. While a wide variety of schemes for group sleeping rooms with separate study rooms have been worked out, there are serious disadvantages. Contagion from colds and coughs and the annoyance from late comers, make the group sleeping arrangements not so good. Many fraternities and a few sororities have adopted the plan. While it reduces costs considerably, the plan has not proved entirely satisfactory. After weighing these various considerations, the management for Mary Mayo decided on double rooms with a few singles.

These double rooms, 11″ 6′ by 16″ 6′, have worked out rather well. Several different furniture arrangements are possible. The girls enjoy changing the furniture around, and the grouping gives surprising variety.

The social rooms of the dormitory deserve careful study. On each floor of Mary Mayo, at the corridor ends, small living rooms are arranged, with arched openings that light the corridors and relieve what otherwise might be monotonous passageways. These "sun-rooms" form a popular rendezvous for social functions. On the main floor, a general living room for entertainment, and a small library and screened-in porch looking out on the terraced gardens, add to the attractiveness of the entire building. The dining room is conveniently available for dancing, opening up through a spacious lobby into the general living room. Here the girls may entertain their friends. It is desirable to have another large private living room for girls who are not entertaining but who desire a good time among themselves.

The all-important thing to remember in planning the social rooms of a dormitory is that value comes from satisfaction. The dormitory should be a popular place regardless of the fact that undergraduate students are required to live on the campus. The result of a socially popular dormitory is financial stability.

The Importance of Ample Lighting

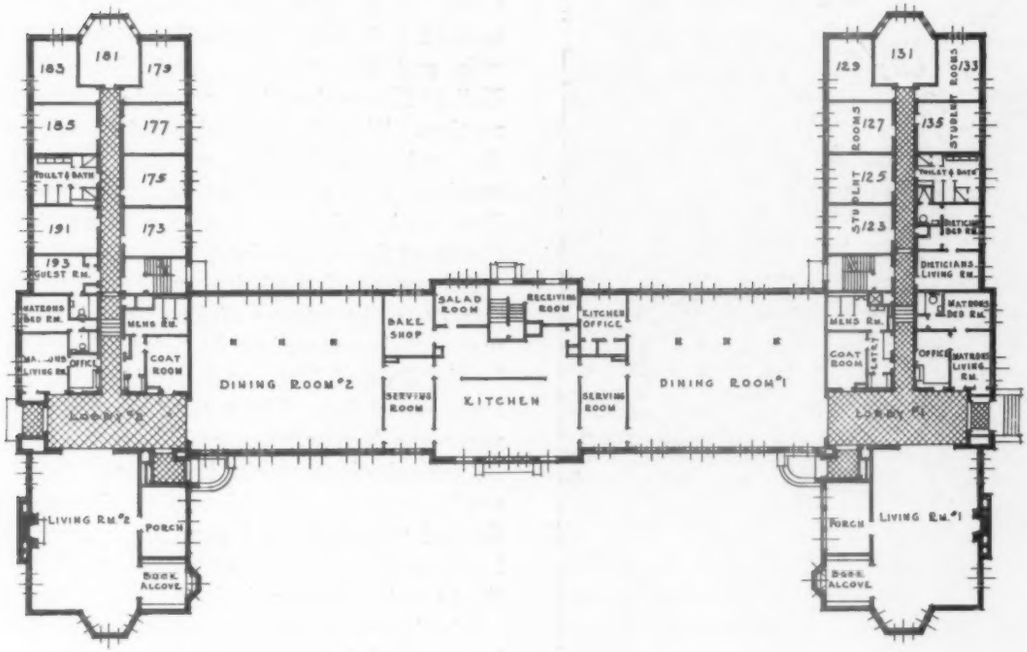
Many desirable factors may contribute to the comfort and livability of a dormitory—factors which add little to the cost of planning. The first is ample lighting, both natural and artificial. Much expense in electric bills would be saved on dull days by large windows. The added sunlight contributes to health of body, and reduces eye strain. In the matter of lighting, roof dormers are particular offenders. As ordinarily designed, the sloping lines of the roof cut into the rooms in a picturesque fashion, further reducing the initial efficiency of the lighting from windows already too small.

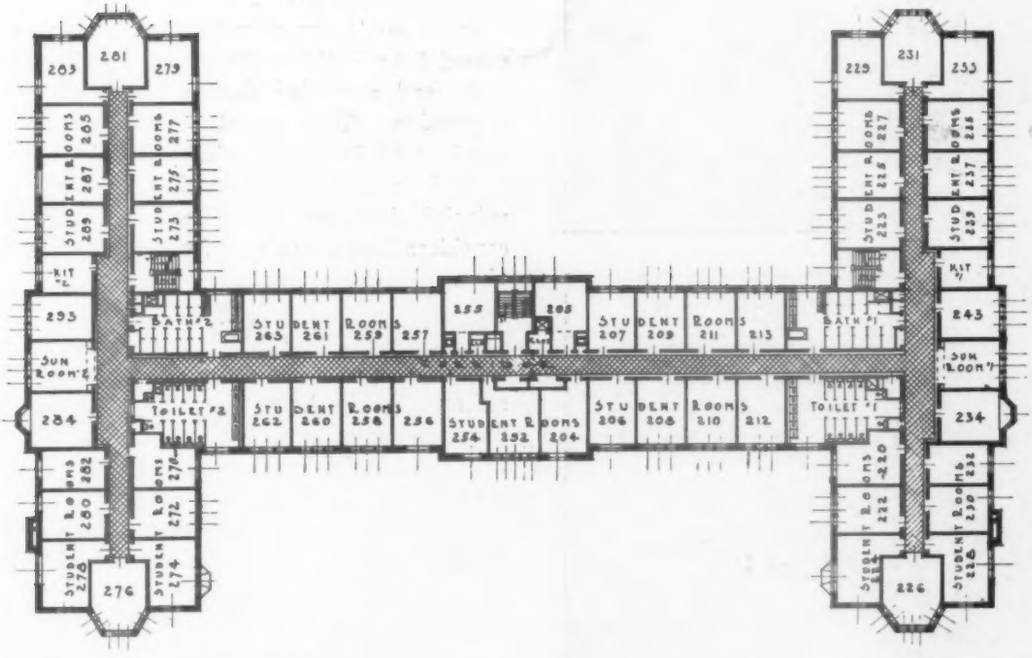
Particular attention is called to the group gables and dormers in the accompanying photographs. To conform with the general architectural requirements of the campus at Michigan State College, sloping roofs were necessary. The group dormers proved not very attractive but gave a utilization of the upper floor space almost equal to that of the lower floors, a result not often achieved in dormitory construction. Well-lighted stairways, and rooms for food preparation that are flooded with sunshine, coupled with amply lighted dining rooms, living rooms, and enclosed porches, conform with the thought of architecture as a program for living, in which sunshine and health must play a prominent part.

Maintaining the Safety of the Long-Time Loan

These general considerations have been gone over at some length because they lead up to the underlying idea behind the self-liquidating dormitory plan—namely, low amortization of principal over a period of years. This means that twenty to thirty years are given to pay back the loan, with equal annual payments for the interest plus principal. To insure the safety of such a loan, everything must be done to keep the buildings modern and desirable throughout the life of the loan, and thereafter. It is therefore good

First Floor Plan





Second Floor Plan

business to beautify the buildings in every way possible. A building may depreciate with age—but gardens and trees grow lovelier with time. Charlottesville, and Mount Vernon, and Monticello and Hollis Hall at Harvard—all may well be studied in this connection. Though the budget of the dormitory may show what to the banker seems a small excess of earnings over capital requirements, the satisfaction from such buildings insures a more than ordinary degree of financial safety.

An appreciation of these principles has contributed greatly to the success of European housing in recent years. It has contributed much to the results obtained by the Federal Housing Administration in promoting home ownership. The college rooming house of fifty years ago is now often so obsolete that in our cities its logical place would be the "blighted area." It awaits replacement with modern fireproof structures, flooded with light and sunshine, planned for greater health and better social opportunity. For these things, the parents of our collegians will gladly pay.

The human story of dormitory management which is recorded in the accompanying figures indicates several things. First of all is the high sense of obligation of the average college student. Losses from non-collection of dues were small during the depression. The second is the extent to which parents will sacrifice to maintain their children in college. With practically all the banks closed in the state, it was quite remarkable how well the State College carried on. The losses in the college year of 1932-1933 were heavy enough, but were quickly made up in succeeding years. The cumulative totals of the five-year period show both interest and amortization earned—a remarkable record for a building first occupied after the crash of 1929, and operating during the worst years of the depression. That social desirability is a primary requisite to financial stability has been well demonstrated in this instance. In too many cases this principle has been lost sight of. Yet these humane considerations augur well for the future success of the plan.

Effect of Policies on Earnings

Dormitory policies are also reflected in the earning statements. In the years of the depression, it was impractical to adhere to the terms of the agreement under which the dormitory was built. This agreement contained a clause to the effect that other dormitories owned by the college were to be closed if it were found impossible to fill the new building. Because of the low cost of the rooms in the older dormitory buildings, the college agreed to absorb any deficit from vacant rooms in the new building, rather than inconvenience the students who were severely embarrassed by the

bank closings throughout the state. This deficit has been made up by subsequent earnings.

In 1934, compulsory freshman residence for women on the campus was adopted, a principle of operation delayed for a year owing to the depression. However, the dormitory does not care for all the freshmen. It has representation from all the classes, a plan which has decided advantages in maintaining a dormitory tradition. This plan also swells the waiting list, which is a most desirable thing to have, particularly when it is necessary to bar students who would not contribute to the social welfare of the group. A dormitory exclusively for freshmen requires more supervision than one for all under-graduate classes. The number of freshmen students who drop out of college during the freshman year for academic or other reasons is considerably higher than in the upper classes. A 5 to 7½ per cent vacancy over the period of the year seems to be a practical working minimum for conditions at Michigan State College.

The dormitories are used only occasionally in summer school, but their growing popularity, the increasing student income, and the growth of the summer sessions, will some day make an added source of revenue when it becomes practical to keep the dormitories open.

In setting up the budget, the management and service costs for both dining rooms and living rooms should be carefully segregated. The dining room makes valuable contribution to the stability of the self-liquidating plan. Through lower food costs, concentrated purchasing power, and carefully planned kitchens, the dormitory has considerable advantage over its normal competitors. The cost of board quickly follows the fluctuating trend of food costs. The dining rooms can practically always show a profit, even through a depression period. On the other hand, when room rents fluctuate, fixed interest charges remain high. A reduction in room rents, therefore, is rather serious. Boarding in the dormitory is a practically mandatory requirement where the self-liquidating plan is in operation.

Estimating the cost of electric power and service is always a difficult problem. At Michigan State College, the dormitory gets heat and light from a modern and economically operated power plant, and the charges are made at cost. These two items amount to approximately 50 cents a week per student. As compared with apartments, the light and heat costs in a dormitory are rather high. Janitor service has been reduced by most scientific study. The water softening has proved a great luxury at a relatively small cost of operation.

In caring for repairs, a reserve fund is set aside annually, and from these funds repairs are charged directly. Where repairs are set up as an expense item, they are sometimes neglected when other costs run higher than budgeted. With the reserve plan, this situation is avoided. In Mary Mayo Hall, the greatest care was used in specifying permanent materials, and in keeping everything in first-class repair. This has proved a most economical procedure. It also adds attractiveness to the dormitories, and helps maintain a spirit of pride in the building. This contributes to thoughtful and careful use by the girls.

Cooperation with the Domestic Science Department and the Department of Institutional Management in the dormitory has been a source of mutual advantage. The hotel management course uses the dormitory as an experimental laboratory in food preparation and testing. This has somewhat reduced management costs and contributed to the success of the venture.

The building cost $359,000, and the furnishings $53,500, a total cost of $412,500. The depreciation reserve on the building was fixed at one-half of 1 per cent, and the furniture reserve at 8 per cent. The total bond issue was $425,000. The bonds are callable at a slight premium.

Appended are two tables, one showing the summarized results of five years of operation, and the other showing the individual expense items for 1935. These tables suggest an excellent accounting system and should prove of advantage to any one interested in dormitory management.

The Planning Personnel

In conclusion, the work of those actively interested in planning the building should be mentioned. The President, Robert G. Shaw, the Secretary, Herman H. Halladay, and his successor, J. A. Hannah, have all taken a most active interest in the planning and management of the building. The Dean of Home Economics, Dr. Marie Dye, and the Dean of Women, Miss Elisabeth Conrad, have cooperated in the work of management and social supervision, and deserve much credit for the successful showing that has been made. The landscape work was designed by T. Glenn Phillips, who was consultant for the College plan. The plans were originally prepared by Malcomson, Higginbotham and Trout, a partnership now dissolved. The work of design was done by Ralph Calder, now with Malcomson and Higginbotham Inc. The architectural plans and general financial scheme were developed by the writer.

It is hoped that the procedure outlined and the general objectives and methods of approach to the problem will prove of value. The hearty cooperation between all interested groups, and their genuine interest in the welfare of the students, have made possible the success of the enterprise.

MARY MAYO HALL, MICHIGAN STATE COLLEGE. CONDENSED OPERATING STATEMENT, FISCAL YEARS ENDED JUNE 30, 1932-1935, INCLUSIVE (SUPPLEMENTARY)

	Nine Months June 30, 1932	Year Ended June 30, 1933	Year Ended June 30, 1934	Year Ended June 30, 1935	Combined
INCOME					
From operations	$81,793.71	$72,055.70	$68,692.09	$86,717.99	$309,259.49
EXPENSES—OPERATIONS					
Salaries	$10,273.17	$10,978.27	$ 7,930.53	$ 3,414.74	$ 32,596.71
Labor	10,329.96	9,284.31	5,514.05	10,715.19	35,743.51
Food supplies	16,542.25	13,880.11	13,058.48	17,604.88	61,085.72
Other supplies	704.87	490.16	495.45	517.67	2,208.15
Laundry	906.99	755.98	926.03	847.84	3,436.84
Water softening	571.37	128.88	246.54	267.52	1,214.31
Miscellaneous	135.64	26.79	33.37	442.04	637.84
Utilities	4,500.00	4,500.00	4,500.00	5,422.20	18,922.20
Janitor service	2,263.56	2,341.69	2,011.30	2,595.28	9,211.83
Insurance	395.90	395.91	260.44	395.91	1,448.16
TOTAL	$46,623.71	$42,782.10	$34,876.19	$42,223.27	$166,505.27
NET FROM OPERATIONS	$35,170.00	$29,273.60	$33,815.90	$44,494.72	$142,754.22
EXPENSES—OCCUPANCY					
Trustees' fees	275.00	275.00	275.00	275.00	1,100.00
Interest	18,496.76	24,580.87	24,435.00	24,090.00	91,602.63
Repairs from depreciation reserve	867.52	635.92	676.98	702.21	2,882.63
New equipment from depreciation reserve	408.88	327.92	354.95	1,234.56	2,326.31
Balance from depreciation reserve	3,251.72	5,073.57	5,005.60	4,100.70	17,431.65
TOTAL	$23,299.88	$30,893.34	$30,747.53	$30,402.47	$115,343.22
GROSS OPERATING PROFIT	$11,870.12 D.	$ 1,619.74	$ 3,068.37	$14,092.25	$ 27,411.00
BOND REQUIREMENTS					
Retirement	.....	$ 3,750.00	$ 5,750.00	$ 6,000.00	$ 15,500.00
Retirement reserve	1,875.00	1,750.00	2,475.00	3,070.00	9,170.00
TOTAL	$ 1,875.00	$ 5,500.00	$ 8,225.00	$ 9,070.00	$ 24,670.00

NOTE: The Michigan State College dormitory, to all intents and purposes, is operated just as if it were owned by the College. The accounting work is handled by the school, as well as the details of assignment of rooms and general supervision. The dormitory bonds, however, are paid off through the sponsorship of a trustee who represents both the College and the bondholders. Unfortunately, under this arrangement, the bonds are not Federal income tax-free, and the interest rate under present conditions is excessive. This situation will be met, however, by calling the bonds as soon as legal difficulties can be worked through, at which time the fixed charges will be materially reduced.

The bond retirements—on October 1 of each year—are in the following amounts: 1933, $5,000; 1934, 1935, 1936, $6,000; 1937, 1938, 1939, $8,000; 1940, 1941, 1942, 1943, $10,000; 1944, 1945, 1946, $12,000; 1947, 1948, $14,000; 1949, 1950, $15,000; 1951, 1952, $17,000; 1953, 1954, 1955, $20,000; 1956, 1957, $24,000; 1958, $25,000; 1959, $77,000 ($40,000 in $500 denominations).

In order to pay this amortization, an annual payment of 6.6 per cent for the first year, 7.3 per cent for the second year, and 8 per cent for the third and succeeding years, is paid in the form of rental. These rentals enable the trustee to meet the current payments on bonds as well as interest and build up a reserve fund which will be used for taking care of the final bond payment at the end of the 26th year.

This arrangement helps avoid the difficulty so often met in real estate bonds, of having a default due to a year of losses—which defaults not only the principal for that year, but all of the succeeding principal as well. In practice, the plan has actually worked very well. The bonds have come through with a clear record, except for a temporary impounding of interest in one of the closed banks. While this principle of setting up a reserve or cushion was very rare at the time these bonds were issued, it has been quite widely adopted in recent financing. Credit for this arrangement is due to Henry Hart, of the First of Michigan Company, one of the country's most distinguished financiers.

MARY MAYO HALL, MICHIGAN STATE COLLEGE. OPERATING STATEMENT, YEAR ENDED JUNE 30, 1935

Revenue	For Student Rooms Only	For Dining Room Only
Room rent—Cash receipts	$34,560.04	.....
Board—Students	.....	$46,498.46
Staff allowance	1,603.98	4,983.00
Miscellaneous income	339.51	33.13
	$36,503.53	$51,514.59
Less refunds to students	599.73	700.40
Total Net Revenue	$35,903.80	$50,814.19
Expenses—Operating		
Salaries—staff	$ 725.00	$ 2,689.74
Labor—general	$ 10.00	$ 4,110.78
student	1,701.30	6,389.11
	$ 2,436.30	$13,189.63
Food supplies	.....	17,604.88
Stationery and office supplies	39.84	4.18
General supplies	74.10	399.55
Laundry	384.16	463.68
Water softener salt	267.52	.....
Postage, telegraph, etc.	255.30	144.30
Miscellaneous	10.00	12.50
Freight	.....	19.94
Janitor—labor	$ 2,137.12	.....
general supplies	330.87	.....
lavatory supplies	108.94	.....
express	.....	.....
upkeep equipment	18.35	.....
	$ 2,595.28	.....
Utility service—M. S. C.	3,615.54	$ 1,806.66
Insurance	269.67	126.24
Total operating expense	$ 9,947.71	$33,771.56
Net income from operations	$25,956.09	$17,042.63

Note: In the item of salaries and labor, there have been several variations in the accounting practice. In some instances room and board were charged directly against the salaries and credited to income. This had the effect of increasing the salary rolls. In 1932 and 1933 there was considerable sentiment against cutting salaries, and for that reason the rigid economies of the depression do not appear until the 1934 accounts.

At that time it was found that certain of the operations of directing the dining room and food preparation, as well as the social activities, could be put on a part-time basis, the balance of the salary being paid by the Department of Home Economics, or the Dean of Women's office, where the remaining time can be used to advantage. Such an arrangement is often a practical and desirable economy in dormitory operation.

Author's Note (January 20, 1937).—The refinancing procedure suggested above has been completed, both for Mosher Jordan Hall at the University of Michigan and for Mary Mayo Hall at East Lansing. Bids have also just been taken for a second dormitory at East Lansing, which was sent out for figures a year ago, and was recently figured at an advance of 11½ per cent, indicating that building prices have not greatly advanced. Unit costs are comparable with Mary Mayo. The new financing, based on revenues from dormitory income only, and not guaranteed by the state or the College, is state and Federal income tax free. The coupon rates average under 3½ per cent for serial bonds running from one to fifteen years. A small contribution by the College, and low interest rates based on a demonstration of earning power, make possible complete amortization in a fifteen-year period.

A STUDENTS' DORMITORY AT PONDICHERY, INDIA

BY ANTONIN RAYMOND

Architect, Tokyo, Japan

AUROBINDO GHOSE is a Hindu philosopher, now advanced in years, and enjoying the veneration of a vast multitude. A group of disciples from all parts of the world has gathered about him and it is in order to house them that the dormitory was planned.

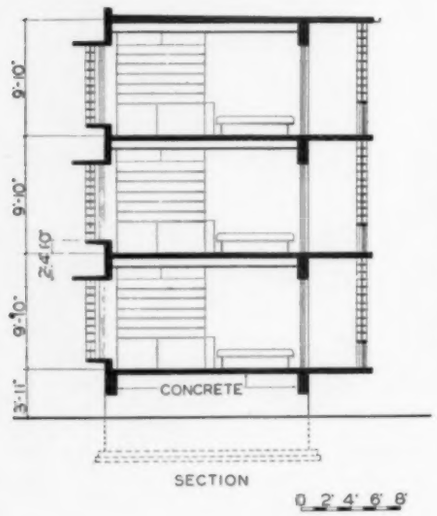
In designing the dormitory for the Ashram in Pondichery we felt on the one hand the problem of making for students of religion a home filled with an atmosphere of repose and serenity and a just measure of physical comfort and commodities; on the other of satisfying the present-day economic, climatic, sanitary and structural requirements. This we did directly without reference to any ancient order of architecture, thus answering, as we thought, the demands of eternal intelligence in the forms naturally evolving out of these conditions fulfilled.

The dormitory is to offer each student a quiet and pleasant place in which to sleep and study. The common rooms and dining rooms are elsewhere.

The climate is tropical. Good ventilation is desirable, and at the same time protection from heavy rains with strong winds during the rainy season.

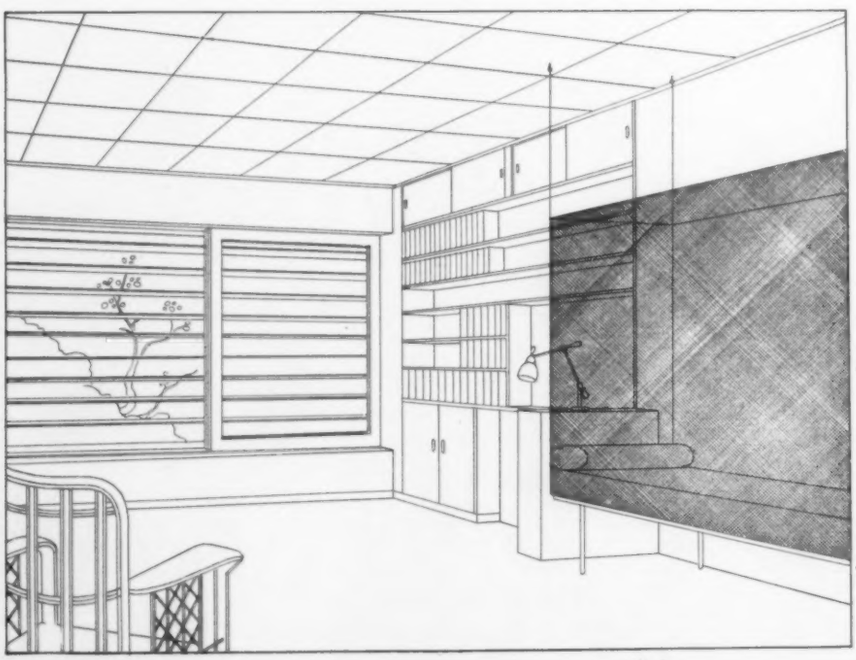
The building is turned so as to face south-southeast, giving each room full cross-ventilation. It permits 15 rooms of the required dimensions on each floor; and preserves for each room an extended view. By this means also a number of irregularly shaped gardens are formed, each one of which at some time of the day affords shade and a corner distant from the sounds of the street.

Structurally, the building is logical and economical. The bearing walls of brick, which is cheap and easily obtained, divide the rooms one from another, furnishing the necessary insulation and accommodating the built-in furniture. The floors are slabs of concrete, cantilevered to form the gallery that serves as corridor. The window overhangs and the sills are also monolithic with the floors.



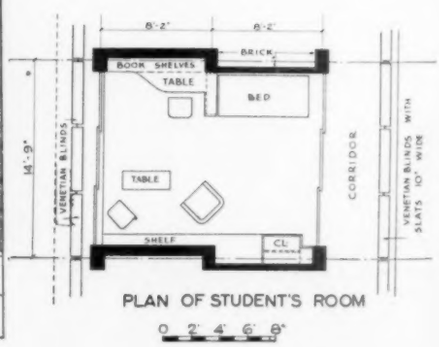
CROSS-SECTION

The first floor, a reinforced concrete slab, is raised on brick piers from the ground for the sake of dryness, then the brick wall is continued again with another concrete floor slab and so on up to the roof



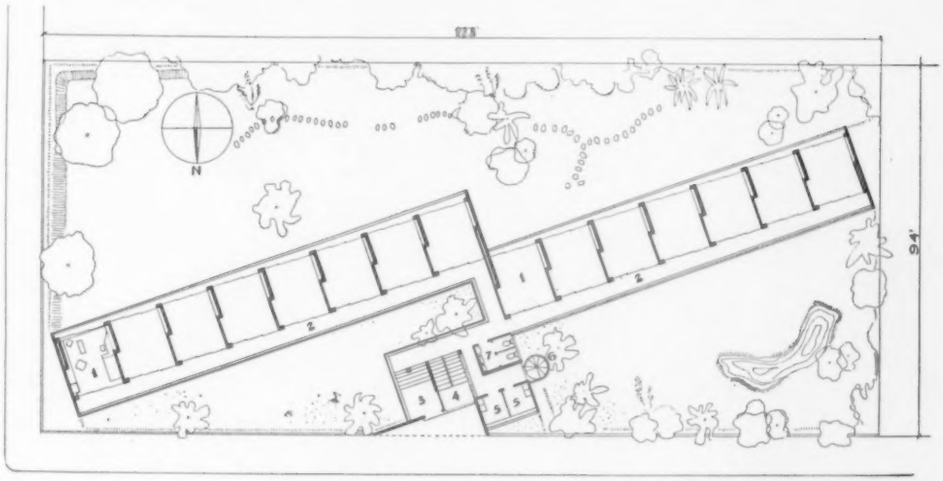
A STUDENT'S ROOM

The furnishings are simple but sufficient. Each room is supplied with built-in bookshelves, table and closets. The bed consists of a spring mattress on a wooden stand with steel legs



The stairs, toilets, and showers are centrally located, but form a separate mass. They do not interfere with the regularity of the main design.

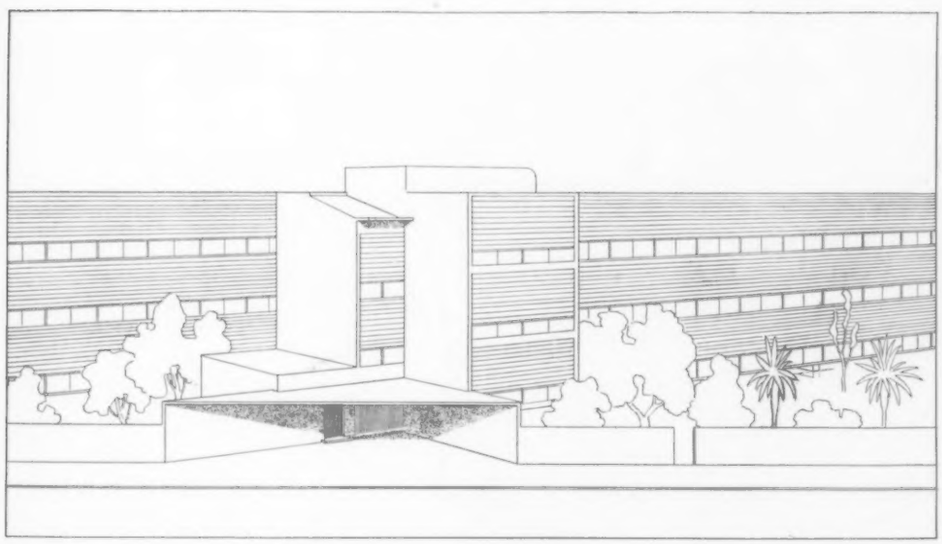
Venetian blinds with blades 10 inches wide are used to protect the openings against the glare of the brilliant sunlight. They are a protection against rain, yet permit the free circulation of air. The generous overhangings also protect the openings. The blinds are supplemented with wood sash sliding windows for use in case of driving rain. The rooms are closed on the gallery side with light sliding wood frame doors, covered with cloth.



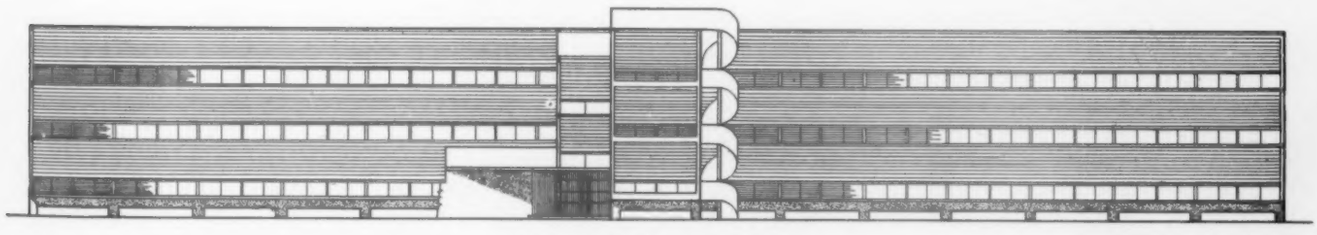
FIRST FLOOR PLAN

0 5 10 15 20 25'

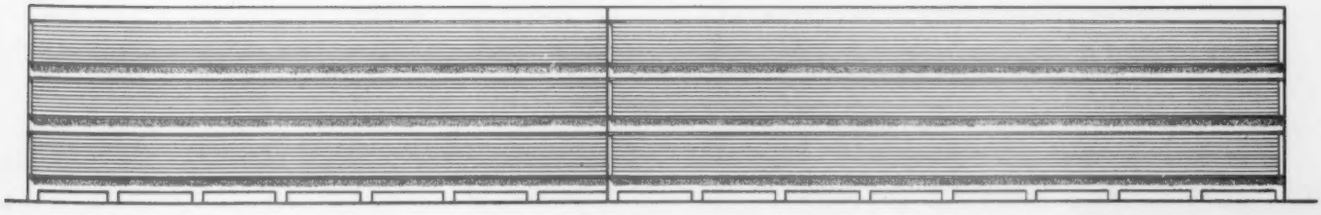
1 STUDENT'S R'M
2 CORRIDOR
3 VESTIBULE
4 STAIRS
5 SHOWER
6 SERVICE
7 W·C·



No rugs are necessary on the cool tile floor, and the blinds make curtains unnecessary. The building is virtually complete when the builders move out.



Entrance Facade of Dormitory

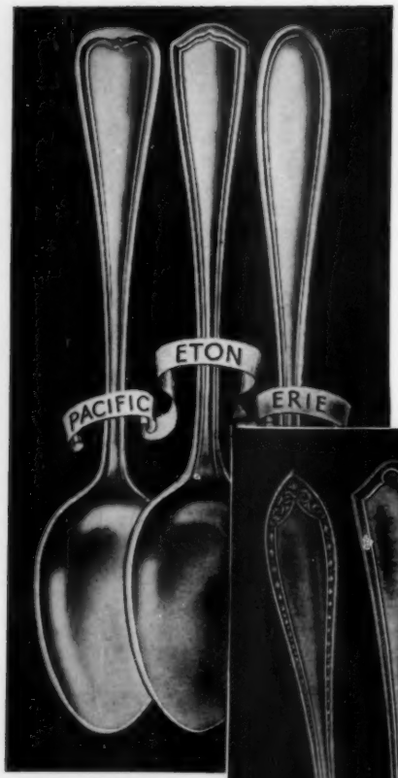


Garden Elevation

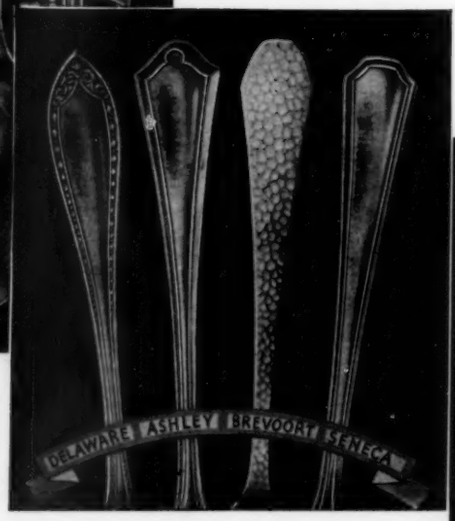
ONEIDA HOTEL PLATE

By the Makers of Community Plate

Oneida, New York



10½ Lb. Extra-Heavy Blanks



9 Lb. Heavy Weight Blanks

4 Qualities

It costs no more to have

SILVER PLATE

by ONEIDA LTD.

And you are buying plate that is not only pleasing in appearance but is built to endure.

●

This scientifically constructed silverware costs less in the long run —saves overhead expense—and reflects an appearance of quality on your tables.

●

For the severe usage that silverware necessarily has to receive in school cafeterias, lunch rooms and home making departments, only a scientifically made silverware will give satisfactory wear.

Why buy unknown brands when you can purchase silverware made by the **ONEIDA LTD.** at lowest possible prices.

●

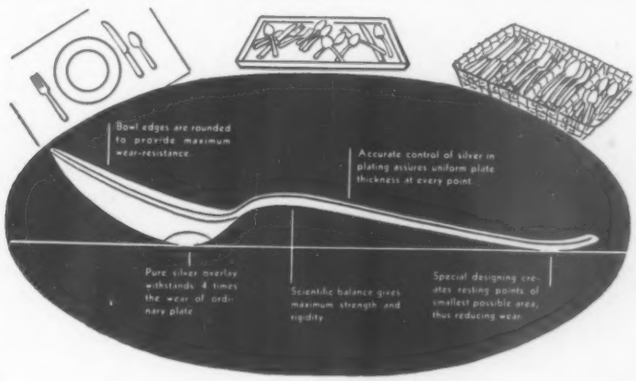
Above you have your choice of eight easy-to-clean patterns. There are two weights of blanks and three qualities of plating.

When you buy our silverware with overlay, the principal pieces all bear at the point of greatest wear an "overlay" or disc of pure silver giving this point an added protection.

Write for Price Sheets and your nearest Distributor's name

THE AMERICAN SCHOOL AND UNIVERSITY

SCIENTIFICALLY BUILT TO RESIST WEAR


Bowl edges are rounded to provide maximum wear-resistance.
Accurate control of silver in plating assures uniform plate thickness at every point.
Pure silver overlay withstands 4 times the wear of ordinary plate
Scientific balance gives maximum strength and rigidity
Special designing creates resting points of smallest possible area, thus reducing wear

That's why

ONEIDA HOTEL PLATE

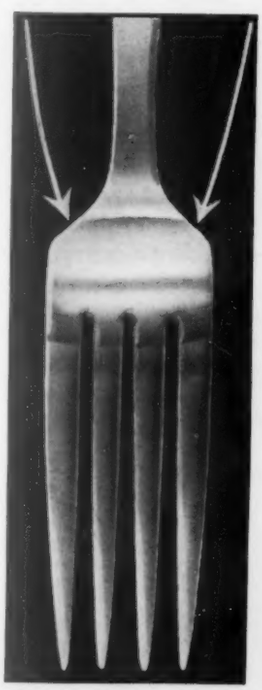
lasts longer

"Details" of design assume major importance in institutional service. For these "details" provide resistance to withstand the wear of daily use and thousands of washings. Oneida Hotel Plate continues to be attractive on your tables year after year.

Why gamble with unknown brands when Oneida Hotel Plate costs no more originally and costs **less** in the long run?

← Spoons have overlay at back of bowl at point of greatest wear.

Forks have overlay as indicated and tines go through unique heat-treating process eliminating bending in service or washing. →



ONEIDA HOTEL PLATE

By the makers of COMMUNITY PLATE

SCIENTIFICALLY BUILT TO RESIST WEAR

THE ALUMINUM COOKING UTENSIL COMPANY

New Kensington, Pa.

Oakland, Calif.

BRANCHES

Baltimore, Md. Boston, Mass. Chicago, Ill. Cleveland, Ohio Kansas City, Mo. Minneapolis, Minn. New York, N. Y. Philadelphia, Pa.

"WEAR-EVER" GAS HEATED STEAM-JACKETED KETTLE

This kettle is ideal for use where cooking must be done for a large number of persons, but where steam is not available the year 'round. It will do everything expected of a regular Steam-jacketed Kettle operated on a steam line.

About 60 minutes are required to bring water to boiling point and create steam in the 60-gallon size of this type kettle. Made in seven sizes from 15 to 60 gallons capacity.

"Wear-Ever" regular steam-jacketed kettles which can be operated with steam or electricity are available in sizes from five to 300 gallons capacity.

"WEAR-EVER" ALUMINUM TRAY

After years of scientific research, metallurgists have discovered a formula for an amazing new alloy for trays, combining all of the ideal qualities for cafeteria service. Come in eight sizes—natural or alumilite finish. We invite you to put these new trays to a service test.

"WEAR-EVER" RANGE UTENSILS

The "Wear-Ever" line of heavy-duty aluminum ware includes everything needed in the form of range utensils—sauce pans, sauté pans, stock pots, etc.—all made of thick, sheet aluminum, every utensil stamped from single piece of metal without joints or seams and with extra thickness of metal where needed to resist wear.

For full information regarding these range utensils, see your regular supply house, or write for catalog.

"WEAR-EVER" PITCHERS WITH COOL HANDLES

permit easy and comfortable handling of hot liquids. Of course they are suitable for use with all kinds of liquids. These pitchers are available in capacities from one to five quarts.

There is a comprehensive "Wear-Ever" booklet on heavy-duty aluminum ware. It is FREE. Send for your copy. Address: THE ALUMINUM COOKING UTENSIL COMPANY, 11TH STREET, NEW KENSINGTON, PA.

Since 1848 **THE G. S. BLODGETT CO., INC.** Since 1848

Burlington, Vermont

BLODGETT'S NEW GAS OVENS

Especially Suitable for School Kitchens

THE BAKER-ROASTER COMBINATION OVEN

2 in 1

Two separate ovens in one; each compartment having separate burners, and each compartment having its own automatic heat control.

FEATURES:

1. Large roasting requirements can be handled in the No. RB-15 or R2-15. At the same time baking can be done. Such flexibility saves time in the working schedule of kitchen employees.
2. Different work can be done at the same time at different temperatures in the two independent compartments.
3. Only capacity needed is used. At times when baking or roasting requirements are light, it is only necessary to use one compartment; thus one-half the amount of gas.
4. Better, higher-class work can be turned out on these ovens, because they bake uniformly—eliminates constant watching and shifting of goods, thus saving operator's time.
5. Solid, thick insulation and automatic heat control reduces gas consumption, makes for cooler workshop and takes the guesswork out of baking and roasting.

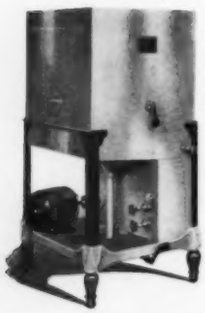
CONTROL YOUR COOKING OPERATIONS

Save with *GAS*—the Better Fuel

CHAMPION DISH WASHING MACHINE CO.

MAIN OFFICE AND FACTORY

Erie, Pennsylvania



Model 1-SD4 Champion Rack Type for Hand Feed

Consider the wide range of sizes and types of dish washing equipment offered by CHAMPION, running from the small up to the very large, and all designed to meet the exacting demands of school and university requirements.

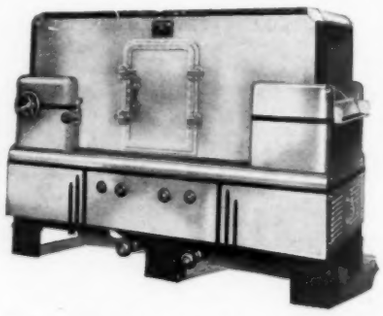
The three distinct types of machines are briefly described:

1. Rack type for hand feed—using racks to hold the pieces to be washed, which are fed manually through the machine.

2. Rack type for automatic feed—same operation as above, except that racks are carried through the machine by an endless chain carrier—making results automatic and uniform.

3. Conveyor type—using a patented Bakelite conveyor to carry pieces through washing, rinsing, and sterilizing sprays. No racks needed, except for silver and other small pieces.

ALL CHAMPIONS have a record for performance, dependability and low upkeep cost. Attention should be paid to the following CHAMPION features:—the simplicity of the pumping system, nothing to wear out—Cast Iron tanks, for durability—large capacities, due to efficient pump and spray systems—above all, the experience of 50 years of specialization on dish washing equipment.



Model 400-B Champion Conveyor Belt Type

Model 20-B Champion Rack Type for Automatic Feed

For more complete information, please write for circulars on any or all types. We shall be glad to discuss your requirements, either by mail or through a representative. Our A. I. A. dimension print folder will be useful to architects.

DOEHLER METAL FURNITURE CO., INC.

DORMITORY CAFETERIA | BEDROOM RESTAURANT | INFIRMARY CHAIRS

General Offices: 192 Lexington Ave., New York City

Typical room in college dormitory. Doehler furniture equipped

The new Doehler metal furniture is cleverly designed to please the eye of the most discriminating buyer. The periods range from conservative Early American to advanced Contemporary modes. The finishes include accurate reproductions of American walnut, mahogany and maple grains as well as a wide choice of pleasing solid colors.

Doehler metal furniture is really comfortable. All metallic sounds have been eliminated. The drawers slide easily and never stick or jam. The durable steel construction will not loosen, crack or splinter. Doehler metal furniture always looks fresh, neat and clean. It is not affected by hard usage, harsh climatic conditions or close proximity to steam heating radiators, open windows, etc. The baked enamel finishes are as hard and durable as those on autos—resistant to rust, cigarettes, spilled liquids and hard knocks.

Doehler now manufactures a complete line of modern chromium tubular furniture especially suitable for club lounges, reception halls and lobbies. The low prices are really remarkable in view of the unusual value built into Doehler metal furniture.

Write for Illustrated Catalogs and Complete Details

EDISON GENERAL ELECTRIC APPLIANCE CO.

5600 West Taylor St.
Chicago, Ill.

Put Your KITCHENS
ON A
Scientific Basis

Only one form of cooking heat is worthy of school use. It is the heat which is clean, dependable, fast. It is the heat which is scientifically accurate and correct. It is efficient Calrod heat, possible only in Edison Electric kitchen equipment.

Edison Electric cooking and baking installations are economical, not merely in operation, but in saved time, uniformity of result, and better food flavor. Vegetable minerals and vitamins are retained, and foods hold their natural food color. Health-giving elements lost in ordinary boiling, nourishing juices that bleed away in flame-roasting, remain to tempt students' appetites.

Automatic temperature control, with which all Edison installations are equipped, eliminates kitchen guesswork and assures correct cooking heat. With current actually on only a fraction of cooking time, you gain not only the economy of low operating cost, but the saving that comes with exact certainty of method.

FEATURES like these put your kitchen on a scientific basis. Ask your kitchen equipment jobber. Or write us —

EDISON

This Horizontal-Type Broiler produces 36 two-pound steaks per hour. Convenient and clean

The Ad-A-Deck Bake Oven bakes at 3 different temperatures at once. Used by many thousands of professional bakers

This Roasting Oven pays for itself in less meat shrinkage. The oven shown has one deck added

This Automatic Egg Boiler, thermostat-controlled, cannot burn out. Current shuts off automatically when water boils dry. Use your old timers if you desire

New Ka 19 complete, automatic Counter Fry Kettle amazingly low priced! Matches capacity and efficiency of higher - priced models

New RA 170, 3 ft. Range, cooking top and oven. Top custom built to fit your needs. Large oven takes commercial roasting pans. Fully automatic. Proved dependability at low cost

EDISON GENERAL ELECTRIC APPLIANCE CO., INC.
5600 West Taylor Street, Chicago, Illinois

EXCEL METAL CABINET CO., INC.

Manufacturers of "Metalcraft" Home Making Kitchen Equipment

101 Park Avenue, New York, N. Y.

"METALCRAFT"

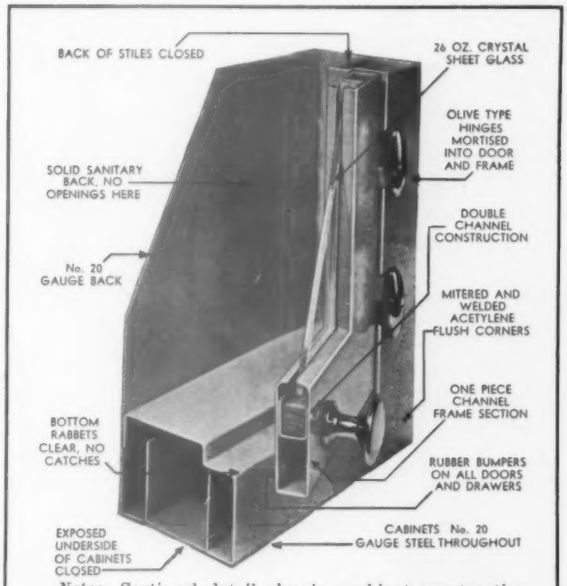
For Home Economics and Domestic Science Laboratories

"Metalcraft" Steel Kitchen Furniture, to be found in many of the country's finest homes, is now being used in ever-increasing numbers of school kitchens and home economics laboratories because of its adaptability to various school requirements, its substantial construction and extremely long life, and its neat and attractive appearance.

Sanitary, efficient and long-lasting, "Metalcraft" cabinets are beautifully finished in the most durable glossy enamel, in white or color; available in many styles and sizes, and installed to meet any requirement or arrangement desired.

Other "Metalcraft" equipment includes stoves, sinks, tables, shelves and glass-enclosed compartments, as shown in the picture below of a recent installation in the "Homemaking Room" at Lawrence High School, Lawrence, N. Y.

Home economic supervisors, school cafeteria managers, school architects and principals are invited to write for a copy of the booklet, "Metalcraft—Home-Making Kitchen Equipment."


BACK OF STILES CLOSED
26 OZ. CRYSTAL SHEET GLASS
OLIVE TYPE HINGES MORTISED INTO DOOR AND FRAME
SOLID SANITARY BACK, NO OPENINGS HERE
DOUBLE CHANNEL CONSTRUCTION
No. 20 GAUGE BACK
MITERED AND WELDED ACETYLENE FLUSH CORNERS
ONE PIECE CHANNEL FRAME SECTION
BOTTOM RABBETS CLEAR, NO CATCHES
RUBBER BUMPERS ON ALL DOORS AND DRAWERS
EXPOSED UNDERSIDE OF CABINETS CLOSED
CABINETS No. 20 GAUGE STEEL THROUGHOUT

Note: Sectional detail showing cabinet construction. All cases have top, bottom and side stiles forming a complete rigid front frame. All hardware solid bronze chromium plated.

All drawers equipped with ball bearing rollers for smooth and silent operation.

Installation of home-making equipment in Lawrence High School, Lawrence, Long Island, N. Y.
Lawrence J. Lincoln, Architect

FAULTLESS CASTER CORPORATION

DEPT. SU-37

Evansville, Indiana

REPRESENTATIVES IN PRINCIPAL CITIES — CANADIAN FACTORY: STRATFORD, ONTARIO

DOUBLE BALL BEARING CHAIR CASTERS

In the office, the library, the study rooms, Quiet is a golden virtue. Faultless Casters are designed for quiet, smooth operation. Faultless Casters swivel quickly and with minimum effort. For the user, they make possible greater efficiency and contentment. Sturdy construction assures years of economical service. The special double ball bearing swivel caster featured here is finished in oxidized copper to harmonize with any furniture.

Notice the double row of polished and specially hardened ball bearings which assures quick swiveling, effortless movement and absolute quiet. The wide shoulder with center of gravity offset at such great distance from the wheel is another Faultless feature that makes for positive swiveling. Dust proof construction.

Packed in 1 Set Individual Display Carton with Sockets, Copper Oxidized Finish

RUBEREX (Cushion Tread) WHEELS

Style Number	Wheel Dia.	Wheel Bearing	Height, Floor to Track Plate
2478	1 5/8	Plain	2 1/8
2479	2	Plain	2 1/2
BG2257-8	1 5/8	Ball	2 1/8

ROCKITE (Hard Tread) WHEELS

Style Number	Wheel Dia.	Wheel Bearing	Height, Floor to Track Plate
2778	1 5/8	Plain	2 1/8
2779	2	Plain	2 1/2
BG2857-8	1 5/8	Ball	2 1/8

FAULTLESS CUSHION CHAIR GLIDES

Faultless Cushion Chair Glides give double protection. The live rubber insulation protects against jars and vibration; the smooth rounded edges of the glide protect floors from being marred.

Faultless Cushion Chair Glides are offered in four sizes. They are sturdily built of formed hardened steel and will outwear the chairs on which they are used. They are finished in oxidized copper to harmonize with any style of furniture.

Packed in 1 Set Individual Display Carton, Copper Oxidized Finish

FLEXIBLE CUSHION CHAIR GLIDES

Number	Diameter Base
NRS	7/8"
NRS	1 1/16"
NRS	1 1/4"
NRS	1 1/2"

CUSHION CHAIR GLIDES WITH MACHINE SCREW ATTACHMENT

Number	Diameter Base
SRS	7/8"
SRS	1 1/16"
SRS	1 1/4"
SRS	1 1/2"
SRS with nut	7/8"
SRS with nut	1 1/16"
SRS with nut	1 1/4"
SRS with nut	1 1/2"

CUSHION CHAIR GLIDES WITH SPRING CLIP SOCKET FOR METAL TUBING

Number	Diameter Base	Approx. O.D.
	For Round Tubing	
ORS	7/8"	7/8"
ORS	1 1/16"	7/8"
ORS	1 1/16"	1 "
ORS	1 1/4"	1 "
ORS	1 1/2"	1 "
	For Square Tubing	
ORS	1 1/16"	1 "
ORS	1 1/4"	1 "

When ordering ORS Glides specify outside diameter of tubing and whether socket is wanted for round or square tubing.

FAULTLESS FURNITURE CUPS

Packed in 1 Set Individual Display Carton

SQUARE ROCKITE OR RUBEREX FURNITURE CUPS

Number	Size of Opening	Weight Per Set
SDC 1 1/2	1 1/2"	6 Oz.
SDC 1 3/4	1 3/4"	7 Oz.
SDC 2	2"	13 Oz.
SDC 2 5/8	2 5/8"	15 Oz.

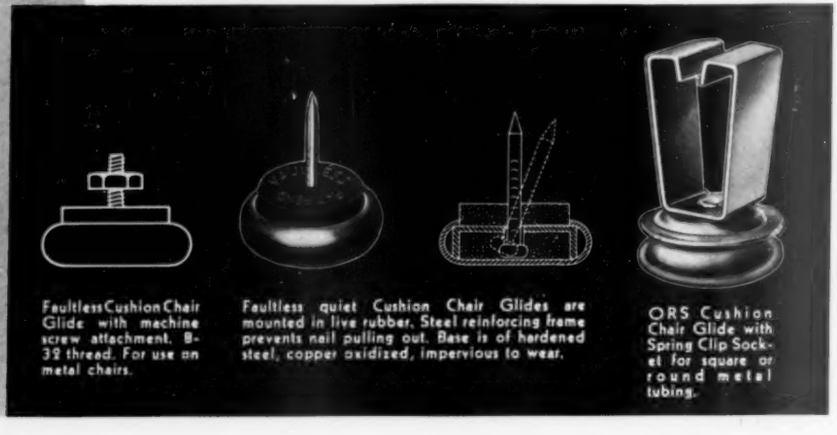
ROUND ROCKITE OR RUBEREX FURNITURE CUPS

Number	Diam. of Opening	Weight Per Set
RDC 1 3/8	1 3/8"	5 Oz.
RDC 1 5/8	1 5/8"	7 Oz.

Be sure to specify whether Rockite (hard) or Ruberex (Cushion) is wanted when ordering.

Faultless Ruberex (cushion) or Rockite (hard) Furniture Cups, for stationary heavy furniture are made of non-breakable, rustproof composition, in a harmonizing brown shade that will not lose color.

Unless otherwise specified, Rockite Furniture Cups will be supplied.



Faultless Cushion Chair Glide with machine screw attachment. 8-32 thread. For use on metal chairs.

Faultless quiet Cushion Chair Glides are mounted in live rubber. Steel reinforcing frame prevents nail pulling out. Base is of hardened steel, copper oxidized, impervious to wear.

ORS Cushion Chair Glide with Spring Clip Socket for square or round metal tubing.

THE HOBART MANUFACTURING CO.

Makers of Electric Food-preparing and Dishwashing Machines

Troy, Ohio

New York Office, 45 E. 27th St., near 4th Ave.
SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES

Chicago Office, 308 W. Randolph St.
SOLD THROUGH LEADING KITCHEN OUTFITTERS

Left—Hobart 20-12 Qt. Mixer, Bench Type. The Equivalent of Two Mixers. Handles Wide Range of Duties in 20 Qt. and 12 Qt. Bowls. Right—Hobart M-80 Super Mixer with Bowl Capacity Up to 110 Qts.

HOBART MIXERS are built in 3, 5, 10, 12, 15, 20, 30, 40, 60, 80 and 110-quart Bowl Capacities. A model for any size kitchen. They mix, beat, whip, blend, mash. With attachments they chop, grind, slice, shred, grate, crumb, sieve, strain, etc.

The Air Whip Attachment, for Hobart Mixers only, adds even more to the value of these machines. Supplies aerating advantages important in cake making, improving texture, taste and keeping quality.

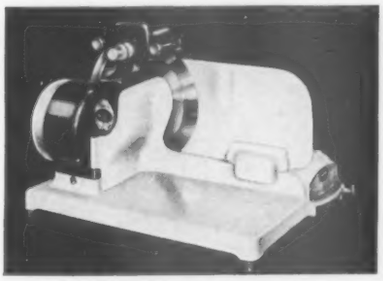
HOBART-CRESCENT GLASS AND DISHWASHERS are made in a wide range of automatic and semi-automatic models to meet the demand for any capacity. They give sparkling cleanliness and a high degree of sterilization. Noted for such exclusive features as revolving wash arms and patented Dual-Drive conveyor. Also complete line of Brush Type Glasswashers.

Hobart-Crescent Model AM-5 Dishwasher, De Luxe Model with Many Advanced Features

Hobart-Crescent Model XM-2 Dishwasher. Fully Automatic. Dual-Drive Conveyor. Washes Thousands of Dishes Quickly

THE HOBART ELECTRIC KITCHEN SLICER AND CARVER combines the newest, most improved features in one machine. Ideal for boneless meats, raw or cooked, bread, cheese, vegetables, fruits, etc. Convenient to operate; speedy, quiet, safe and easy to clean. New Model in black and white Dulux, with Hobart STAYSHARP STAINLESS STEEL KNIFE.

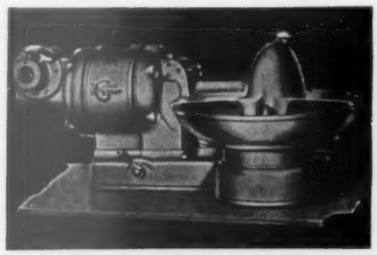
THE HOBART AIR WHIP makes 3 or more quarts of whipped cream from 1 quart of liquid cream in a few seconds. Whips by Air, keeping all the freshness and sweetness of the cream. More and better whipped cream at less cost.



Model 110 Kitchen Slicer and Carver in Beautiful, Sanitary, Black and White Dulux, with New Hobart STAYSHARP STAINLESS STEEL KNIFE

The Hobart Air Whip Unit Revolutionizes Cream Whipping

Potato Peeler



Small Model Food Cutter

HOBART POTATO PEELERS are made in 3 sizes, Bench type as shown above (left) and floor models with capacities from 15 to 45 lbs. peeled in "no time." Negligible peel loss. Can also be used for sweet potatoes, carrots, parsnips, turnips, etc.

HOBART FOOD CUTTERS, with latest features, cut meats, vegetables, fruits, nuts—practically anything in the food line, uniformly, in a few seconds' time.

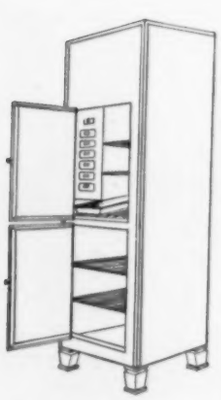
GUARANTEE AND SERVICE. Hobart Machines are built by the World's Largest Manufacturers of Electric Kitchen Machines—even to the motors. An advantage to the kitchen standardizing on Hobart Equipment is that all Hobart Machines are guaranteed and serviced by one nationwide organization. This saves uncertainty, inconvenience and confusion. Further particulars on request without obligation.

THE JEWETT REFRIGERATOR CO.

Buffalo, N. Y.

JEWETT is the oldest name in the refrigerator industry and has been making the finest refrigerators continuously for 86 years—since 1849. Many famous hotels, hospitals, clubs and schools are equipped throughout with JEWETT refrigerators, thousands giving satisfactory service today after three generations of constant use.

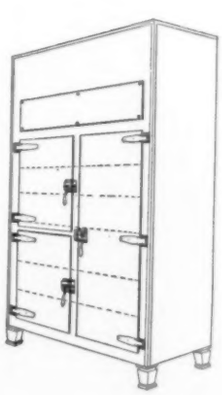
By careful planning in construction and design, JEWETT Refrigerators are now available in standard sizes to meet the definite requirements of School Cafeterias. These refrigerators are furnished complete with the refrigeration mechanism, mounted on top of the refrigerator and concealed by front and end panels, or located on the floor, or below the refrigerator. In the case of Models 59 and 399, the cooling coil is located in the upper section across the top. Model 14 is equipped with an ice cube making coil in the uper left hand section. These refrigerators are available in several standard finishes: Stainless steel, Porcelain or Wood exterior; interior linings are of stainless steel, porcelain or galvanized iron.



One Section Cafeteria Refrigerator No. 14

JEWETT specializes in refrigerators of any type and drawings and specifications will be sent promptly, without obligation upon receipt of a rough outline of the requirements.

Three Section Cafeteria Refrigerator No. 59 Porcelain Interior and Exterior



Two Section Cafeteria Refrigerator No. 399

Our 86 years of experience and careful research have prompted changes in design and construction from time to time and every modification has been thoroughly tested and demonstrated to be positive value before final adoption.

Plan to consult us now on your refrigerator problems and send for our complete catalog.

REPUBLIC STEEL CORPORATION

General Offices: Cleveland, Ohio

ALLOY STEEL DIVISION—Massillon, Ohio

SALES OFFICES AND DISTRIBUTORS IN PRINCIPAL CITIES

ENDURO

REPUBLIC'S PERFECTED STAINLESS STEEL

Licensed under Chemical Foundation Patent No. 1339378

ENDURO Stainless Steel is ideal for coffee urns, steam tables, counter tops, slide rails, shelves and decoration in cafeterias

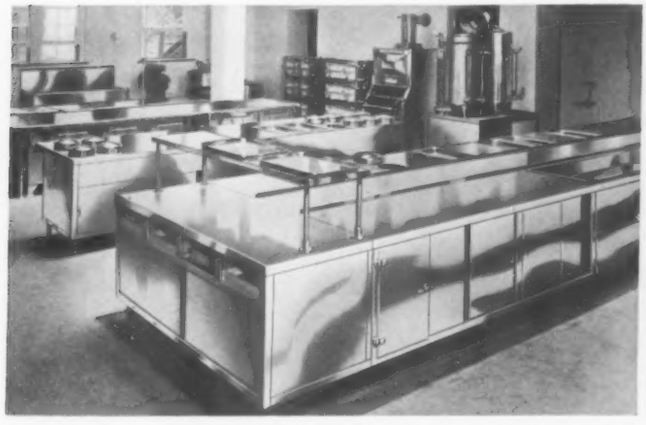
ENDURO Stainless Steel is an unusually versatile metal. It is beautiful, strong, sanitary, long-lasting and economical in the long run. Because of its many advantages it is being widely used in schools, colleges and universities for kitchen and cafeteria equipment, utensils, laboratory furniture and equipment, laundry equipment, sinks, dishwashers, toilet partitions, stairway railings, kick plates, hardware, hoods, ducts, cabinets, shelving, lighting fixtures, grilles, spandrels and other ornamental and practical applications.

In the polished state, ENDURO is a beautiful, lustrous silvery-white metal that retains its fine appearance indefinitely. It is a solid metal, resistant throughout to rust and corrosion. It is unaffected by weather and is resistant to most acids, alkalies, fumes, foods and dairy products. It is stronger than ordinary steel—resistant to hard service and abuse.

ENDURO is ideal for kitchen and cafeteria equipment and for utensils. It is neither affected by foods, fruits, vegetables and dairy products nor does it in any way affect their flavor, odor, color or composition. Because of its low heat conductivity, it will hold heat longer than other metals used for cooking. ENDURO is non-porous, clean and sanitary. Wiping with a damp cloth or an occasional washing restores the original silvery finish.

ENDURO Stainless Steel now in use in schools, restaurants, cafeterias, hotels, hospitals, laboratories and elsewhere is proving its economy through long life and reduced maintenance costs.

Leading manufacturers and fabricators use ENDURO for all types of equipment. Full information, together with names of fabricators in your territory will be sent upon request. Please address Dept. A. M.



A "shining" example of cleanliness, efficiency and economy in kitchen equipment—made of ENDURO Stainless Steel

ENDURO Stainless Steel, because of its high resistance to corrosion and its ease of cleaning, is being used in all types of laboratories

JOHN SEXTON & COMPANY

Established 1883

EDELWEISS QUALITY FOODS

Chicago
500 N. Orleans Street

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SEXTON SERVICE

offers you

▲ The only nationally advertised brand of foods prepared exclusively for the institutional market.

▲ The security of endorsement by all the leading trades associations in the institutional field in the United States.

▲ The facilities of the only wholesale grocery company operating plants in the two principal American markets—Chicago and New York.

▲ As rendered by America's largest distributors of number ten canned foods, a distinctive service on a complete assortment of quality foods packed in this institutional size container.

▲ Home recipe pickles, relishes and conserves from Sexton Sunshine Kitchens—delicious and appetizing.

▲ Carefully selected coffees—blends resulting from years of careful study—roasted fresh daily at Chicago and Brooklyn.

▲ Special quotations based on major purchases of exclusively institutional merchandise—sharing with you the advantages of a greater buying power.

JOHN E. SMITH'S SONS COMPANY

50 Broadway, Buffalo, N. Y.

Manufacturers of BUFFALO Food Cutters, Meat Choppers, Vegetable Slicers and Bread Slicers

(Right) BUFFALO Self-Emptying Food Cutter—Model 120

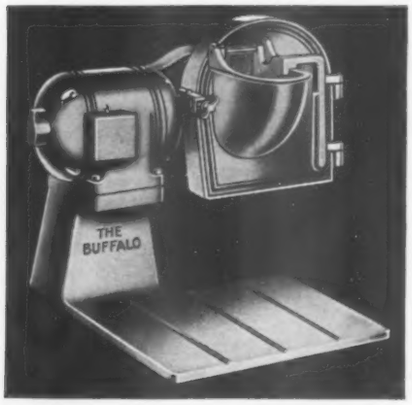
This model is ideally suited for use in large school kitchens. It not only has all the features of efficient, economical operation for which BUFFALO Food Cutters are famous, but it has the additional, exclusive advantage of the self-emptying bowl. After the meat, fruits, vegetables or nuts are chopped to the desired degree of fineness, a simple device automatically empties the bowl, without touching the food. This machine produces better quality chopped foods, eliminates food waste, saves considerable time and labor. Simple, safe, sanitary; easily cleaned.

Diameter of bowl, 20 inches. Capacity, 20 lbs. of meat. Top plate can be removed; bowl not removable. 1 H. P. fully enclosed motor.

(Left) BUFFALO Food Cutter Model 114

This model food cutter is the perfect machine for average school kitchens. It is sturdily built, very efficient in operation, takes up little room and is beautifully finished. Has exclusive safety features: knives well guarded; top plate and bowl are removable. Capacity, 7 lbs.; ⅓ H. P. motor.

All models can be furnished with grinder or vegetable slicing attachments. BUFFALO Food Cutters are made in six sizes. Write for special catalog and prices.



(Left) BUFFALO Vegetable Slicer Model C

A very useful machine in school kitchens. Slices all kinds of vegetables and fruits; grates cheese and bread crumbs; makes French fried, Julienne potatoes; slices or grates nuts. Also makes uniformly thin potato chips.

Can be equipped with five slicing discs and two different style fronts as well as with grinder attachment for producing fine cut hamburger, sausage meat, etc. Has ⅓ H. P. motor.

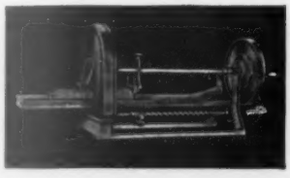
(Left) BUFFALO Meat Chopper

A machine built along the most modern, improved lines. Assures fast, clean-cut operation with no clogging, backing up or mashing of meat. Has a specially designed feed screw, knives and plates of highest grade materials. Produces finest quality hamburger and other chopped meats.

Five sizes. Furnished with open throat or porcelain tray. Model 412 has a capacity of 3 lbs. meat per minute. ¼ H. P. motor. Write for special catalog and prices.

(Below) BUFFALO Bread Slicer

Automatically feeds the bread to the knife, stacking it as it cuts, keeping it fresh. Cuts 175 to 200 uniform slices per minute. Saves two to three slices on every loaf over hand slicing. Made in three sizes, for hand or motor operation.



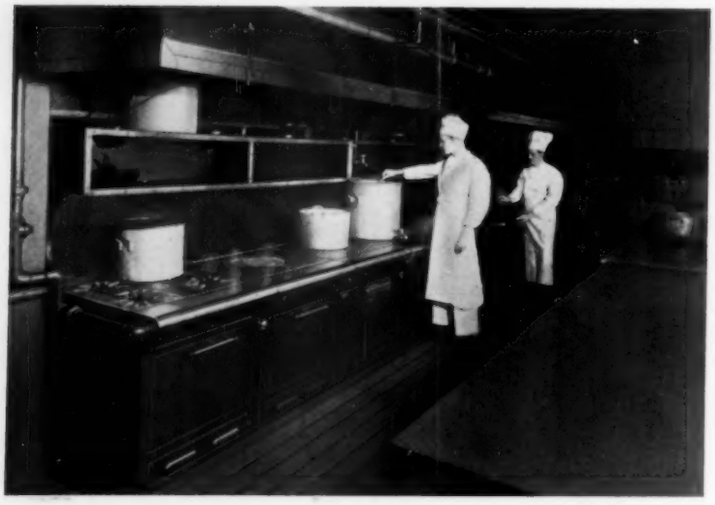
STANDARD GAS EQUIPMENT CORPORATION

18 East 41st Street, New York, N. Y.

Other Conveniently Located Offices at

Boston Philadelphia Baltimore Aurora, Ill. Chicago Los Angeles Portland, Ore.

MODERN VULCAN GAS COOKING EQUIPMENT
Saves from 25% to 50% in Cooking Costs



Installation in College of New Rochelle, New Rochelle, N. Y., includes Vulcan All-Hot-Top, Fry Top and Open Top ranges, and Ceramic broilers

By actual tests, the Vulcan Radial Fin Top range has reduced the amount of gas needed for top stove cooking 20% or more; its insulated heat controlled oven reduces gas consumption 25 to 50%, as many users will testify.

Due to greater speed and capacity, fewer units are needed, reducing investment. Refrigeration costs drop because insulated ovens reduce kitchen temperature; up-keep costs are lowered. Vulcan equipment actually pays for itself in savings made . . . new installations get the benefit right at the start.

Foods are cooked better because heat of range top and oven can be automatically regulated. In a test, meat shrinkage was reduced 66⅔%, resulting in more servings per roast. The new Vulcan Ceramic Broiler produces broiled foods of a quality heretofore unobtainable, broils 35% faster and uses less gas. New Vulcan automatic deep fat fryers produce more healthful fried foods, and soon pay for themselves in fat, fuel and food saved.

Vulcan manufactures a large line of gas cooking equipment, including gas ranges in four sizes and 30 cooking tops, ceramic broilers, deep fat fryers, insulated heat controlled bake ovens and roasting ovens, boiling, waffle and griddle stoves, hot plates, industrial and urn burners, etc. ASK FOR CATALOG.

Schools and College have been specifying VULCAN for 50 years. Here are a few out of hundreds of installations:

Public Schools	Birmingham, Alabama
Tuskegee Institute	Tuskegee, Alabama
Alexander Hamilton High School	Los Angeles, California
Lincoln High School	Des Moines, Iowa
University of Kansas	Lawrence, Kansas
Louisiana State University	Baton Rouge, Louisiana
Bowdoin College	Brunswick, Maine
U. S. Naval Academy	Annapolis, Maryland
Phillips Academy	Andover, Massachusetts
Harvard College	Cambridge, Massachusetts
State Normal College	Moorehead, Minnesota
Phillips Exeter Academy	Exeter, New Hampshire
Princeton University	Princeton, New Jersey
Pratt Institute	Brooklyn, New York
Cornell University	Ithaca, New York
Columbia University	New York, N. Y.
Hunter College	New York, N. Y.
Roosevelt High School	New York, N. Y.
University of Syracuse	Syracuse, New York
U. S. Military Academy	West Point, New York
St. James University	Toledo, Ohio
Girard College	Philadelphia, Pennsylvania
Central High School	Scranton, Pennsylvania
Furman University	Greenville, South Carolina
State Teachers College	Yankton, South Dakota
East High School	Salt Lake City, Utah

VULCAN GAS RANGES FOR DOMESTIC SCIENCE KITCHENS

Vulcan makes a line of gas ranges suitable for domestic science kitchens. They have all the latest developments in gas ranges. . . . Aluminum Speed-Simmer burners, automatic top burner lighters, smokeless broilers, insulated heat controlled ovens, safety oven gas cocks, safety oven racks and others. Many prefer SMOOTHTOP with its closed top and 3-zone top heat.

Submit your problem to us and we will be glad to work with you.

This shows installation in Lawrence High School, Lawrence, L. I., N. Y. Cabinets are placed back to back, alternately with sinks and plain top, with range at one end. Cabinets were built by Excel Metal Cabinet Co., New York

NATHAN STRAUS-DUPARQUET, INC.

Sixth Avenue, Eighteenth to Nineteenth Streets, New York City

BOSTON: 491 Atlantic Avenue
CHICAGO: 1215 Fullerton Ave.

TELEPHONE: WAtkins 9-5200
Cable Address: "STRAUS, New York"

Being a consolidation of three old and noted concerns in the hotel and school equipment business.

The combined skill and experience of the Nathan Straus & Sons' and Duparquet, Huot & Moneuse Co. kitchen equipment plants are now at your disposal. The enlarged displays and stocks of china, glass, silver and utensils await your call. The Furniture Department staff is at your service to help you select draperies, carpets, furniture and furnishings.

The following roster of schools and colleges, listing only a few in which our equipment is now in use, will give you some idea of the scope of our business in the school field: Vassar College, Mt. Holyoke College, Harvard College, University of Notre Dame, Phillips Exeter Academy, Taft School, Newtown High School.

It is no longer necessary to shop in several places. Everything for the equipment and furnishing of the school kitchen, dining hall, bedrooms and public rooms supplied here. 150,000 sq. ft. of display space, stockroom and factory to serve you promptly and efficiently. A large or small order receives the same careful attention.

UTENSILS	CHINA	CARPETS
REFRIGERATORS	GLASS	FURNITURE
KITCHEN EQUIPMENT	SILVER	HOUSEFURNISHINGS

Call upon us at any of the following addresses for prompt service:

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Nathan Straus & Sons, Inc. — ESTABLISHED 1866

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DUPARQUET, HUOT & MONEUSE CO. — ESTABLISHED 1852

UNIVERSAL EQUIPMENT COMPANY

Batesville, Indiana

THE HOMELIKE FURNITURE offered here is pleasingly and especially designed for strength and durability by master craftsmen, in order to withstand the usage furniture is put to in the institutions and schools of America. It is built for schools—strong and durable.

STRENGTH is of utmost importance to you in the purchase of furniture for your institutions. We have incorporated this strength in the product offered and, being situated in a district having the choicest of timbers, we do select lumber that will give maximum strength and long life.

Our furniture has homelike beauty, yet is constructed and finished for institutional wear.

FINISH — Universal Equipment Company furniture is available in a choice of woods; including Oak, Maple, Mahogany and Walnut and is finished in attractive color tones, with special permanent institutional top coats that provide beauty and permanency.

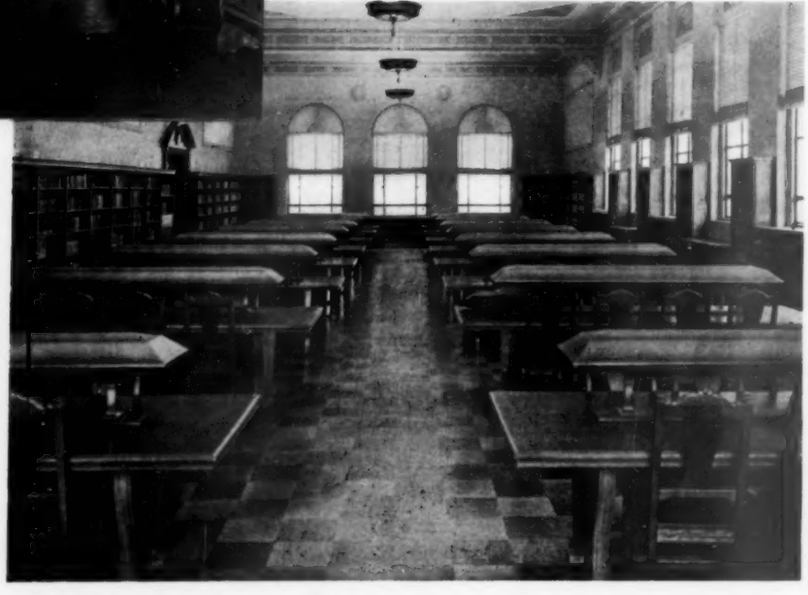
Backed by more than seventy years of furniture building and manufacturing, we are able to offer you a product whose standard of excellence is the very highest.

SPECIAL DESIGNS—We are prepared to submit layouts or to design and build furniture to your individual liking or to harmonize with the architecture of your building. We earnestly solicit such inquiries.

CONTRACT BIDDING—In addition to the models offered here for your suggestion, we also want to figure on your specifications.

Below—

An interesting installation of a library-reading room. The tables and chairs are so designed as to harmonize with the interior architecture thus adding to its individuality. Our designing department can be of service to you



Above—

Sociability is playing a prominent role in the institutions of today. This room is furnished in our Peasant atmosphere. Many similar settings such as this should be of service to you in furnishing your reception room

USE UNIVERSAL EQUIPMENT

in your CAFETERIA, LIBRARY, RECEPTION ROOM and DORMITORY

The furniture illustrated was designed especially to harmonize with the architecture

THE JOHN VAN RANGE CO.

535–555 Culvert Street, Cincinnati, Ohio

KITCHEN ENGINEERING CAN ASSURE SUCCESSFUL OPERATION OF YOUR SCHOOL LUNCH ROOM AND KITCHEN

When THE JOHN VAN RANGE CO. equips a school lunch room or kitchen, it is not acting simply as a manufacturer but as a trained service organization. Our corps of food service specialists, engineers and technical experts constitute a service staff which is in position to handle the complete **planning and installation** of everything necessary to transform the bare rooms into complete cuisines and dining rooms ready for operation.

Throughout our connection with the project and **particularly in the early planning stages,** the experienced counsel of our executives and specialists is available in connection with matters such as organization, operation, space requirements, proportioning of facilities, preparation of preliminary plans, etc. We have acted in this capacity in connection with many of the country's largest installations.

In undertaking the creation of a school lunch room or kitchen, there are certain architectural and engineering problems involved in food service planning. The **food service policy** must be determined: whether the general system of operation shall be as an independent department of the school or as an integral part of the Home Economics Department; whether all students shall use one dining room or shall be separated by sex, age, or other distinctions; the rotation of lunch periods to increase seating capacities; the general arrangement of menus and of distribution of food, the use of dining rooms for other functions, such as study halls or assembly halls, relationship to the building plan, and provision for future expansion.

Other factors which need similar exhaustive study are those affecting **location in the building plan;** important decisions on **kitchen engineering and plan organization;** adequate food storage facilities; **sanitation; elimination of kitchen noises; structural requirements of the building; dining rooms for faculty;** auxiliary requirements of the kitchen, arrangement of service counters; sandwich dispensaries; candy and ice cream sales; **selection of kitchen and dining room equipment and utensils.**

It is important to note that complete analysis **precedes** planning, and that planning precedes any recommendations as to specific equipment required. This is a principle of John Van engineers whether the problem is a complete kitchen and lunch room or a single piece of equipment. With such study as a foundation, with the experience of hundreds of such installations as a background, our engineers prepare complete plans, layouts and specifications for the lunch rooms or cafeterias, kitchen, refrigerators, for the home economics rooms in coordinated systems, store rooms, and all other related departments, providing the superintendent of schools or the architect with the necessary data concerning plumbing, wiring and steam fitting connections, and for lighting, sanitation, ventilating and other vital matters.

Lane Technical High School, Cafeteria, Chicago, Illinois

THE JOHN VAN RANGE CO.'s position of leadership in the kitchen equipment industry extends back through almost a century of competent performance and honorable dealing. Its service organization combines technical expertness with generations of practical experience. Thousands of the most representative schools and colleges are John Van equipped.

No matter how large or small the kitchen engineering problem, the John Van organization welcomes the opportunity to cooperate wherever questions of food service equipment are involved. In planning the equipment and arrangement of the new Lane Technical High School, Chicago's largest high school, the services of John Van engineers were advantageously employed. Later, when this installation was completed under John Van supervision, the efficiency of the planning was proven; there were no "extras," no ugly mislocated pipes; every function was performed as predetermined. This installation is exemplar of the thoroughness with which John Van engineers provide for every detail. Whether your school is in the planning stage, or shows glaring evidences of inefficient arrangement, worn out or obsolete equipment, high fuel bills, chilled food in the serving counter, etc., in your existing operation, it will not cost you a penny and may save you hundreds of dollars to obtain John Van's analysis and recommendations.

TYPICAL VAN-EQUIPPED SCHOOLS

Lane Technical High School	Chicago, Illinois
Brooklyn Technical High School	Brooklyn, N. Y.
Boston Public Schools	Boston, Mass.
Cincinnati Public Schools and University	Cincinnati, Ohio
Central and Eastern Senior High Schools	Lynn, Mass.
Caddo Parish Schools	Shreveport, La.
Atlanta University	Atlanta, Ga.
U. S. Coast Guard Academy	New London, Conn.
Michigan State College Union Building	Ypsilanti, Mich.
Shaker Heights High School	Shaker Heights, Ohio
University of Texas	Austin, Texas
University of Colorado	Boulder, Colo.
University of South Carolina	Columbia, So. Car.
University of North Carolina	Raleigh, No. Car.
University of West Virginia	Morgantown, W. Va.
Hunter College	Bronx, New York City
Purdue University	Lafayette, Ind.
Holy Cross College	Worcester, Mass.
Duke University	Durham, N. C.
Principia Academy	St. Louis, Mo.

Careful engineering presupposes equally diligent manufacture. Once your specifications are completed, the matter of actual purchasing would seem simple. **Oddly enough, though, here is the very place where the school lunch room and kitchen go farthest wrong! For in almost all instances, bids are received on school installations which are not based on the quality originally specified at all!** There is no yardstick of quality because kitchen equipment is not of standardized design. Furthermore, the actual life and value of much of the equipment is determined by things which cannot be detected superficially. For example, the difference in appearance between sinks made of light gauge galvanized iron riveted together and those constructed of heavy rust-resisting steel, welded into a single piece and galvanized afterward, is so slight that it is easy to overlook. The latter is so far superior, however, that a price comparison is almost meaningless. **Know** what you are buying and **know** the integrity and ability of the manufacturer. More important than modern machinery is the skill of Van craftsmen, whose artisanship is reflected in every piece of Van equipment. When you buy Van equipment, you are assured that your school lunch room will always display "That Enduring Quality" which has been the Van mark of distinction since 1853.

This 32 page book has been prepared for educators and architects who are planning a new school or are considering a major alteration of existing food service. Mail requests to 535-555 Culvert Street, Cincinnati, Ohio

R. WALLACE & SONS MFG. CO.

Silversmiths — Founded 1835

Wallingford, Connecticut

BRANCH OFFICES: New York Chicago Philadelphia San Francisco Los Angeles

WALLACE-MADE SILVERWARE

especially designed for

Institutional Use

Style..... with Stamina

Outstanding popularity and unique manufacturing processes . . . plus consequent volume production . . . account for the range of low prices of the six flatware designs shown at the right. Each pattern is made from either a heavy or an extra heavy "blank" of 18% nickel silver and plated with pure silver according to recognized schedules. All six are worthy representatives of the reliable workmanship and quality so characteristic of the products of this 102-year-old firm of silversmiths.

Another important factor has not been overlooked—simplicity in design, insuring easy and complete cleansing.

BUYER'S CHART OF PRICES AND QUALITIES

The prices are NET for Tea Spoons, per dozen. Prices of other staple items would be in proportion. All patterns are regularly butler finished. Write your regular supply house—but if you have any difficulty in obtaining Wallace patterns, write us direct for samples and any further information you may desire. A copy of our complete Catalog No. 836, featuring both flatware and hollow ware, will be sent on request.

SAXON	KENT	WINDSOR	EXETER	CHOATE	ANDOVER	Quality
		$.90 per doz.				The most for the least money. Half Plate . . . Plus. Heavy 9-lb. "blanks."
$.95 per doz.	$.95 per doz.	$.95 per doz.				Longer wear at slight additional cost. Half Standard Plate—Sectional . . . extra plating at points most exposed to wear, on staple pieces. Heavy 9-lb. "blanks."
		$1.10 per doz.				Less cost over long period of use. 5 oz. Plate (tablespoons) sectional . . . heavier than standard plating; more silver at "wear points" of staple pieces. Heavy 9-lb. "blanks."
		$1.35 per doz.				Same as next above . . . except that "blanks" are 11-lb. extra heavy.
			$1.40 per doz.	$1.40 per doz.		Also same as above as to plating schedule . . . but based on "fancy" patterns (Exeter and Choate) and extra heavy 10½-lb. "blanks."
All prices quoted are for Tea Spoons only					$2.00 per doz.	Greater economy in the long run. AA Sectional: 6 oz. plate (tablespoons), much heavier than standard, with extra plating at "wear points" of staple pieces. Extra heavy 11½-lb. "blanks."

All prices subject to change without notice.

WESTINGHOUSE ELECTRIC AND MFG. CO.

Mansfield, Ohio

Sales, Engineering and Service Facilities Available Through Branch Offices, Distributors and Local Dealers

COMMERCIAL REFRIGERATION

Westinghouse provides an outstanding line of commercial refrigeration equipment, including condensing units from 1/6 to 15 horsepower . . . and cooling coils of all types and sizes, to meet every refrigeration requirement.

HERMETICALLY-SEALED CONDENSING UNITS BACKED BY 5-YEAR PROTECTION PLAN

In addition to a complete line of conventional open-type compressors, Westinghouse offers **hermetically-sealed** condensing units with all their money saving advantages.

Sealed in an armor of steel! Permanently oiled, and further protected by the million-dollar "Built-in Watchman!" These units have no belts to break; no shaft seals to need repacking. Power is truly sealed-in; trouble locked out.

So trouble-free and dependable is the famous Westinghouse Hermetically-sealed Unit that Westinghouse backs it with **5-years protection** against service expense on the sealed-in mechanism. Only Westinghouse offers such a long guarantee of satisfactory performance . . . and only Westinghouse furnishes **hermetically-sealed** condensing units for commercial refrigeration applications.

Your choice of water-cooled or air-cooled models

Sturdy Westinghouse Hermetically-sealed Units meet every refrigeration need

EQUIPMENT FOR EVERY NEED

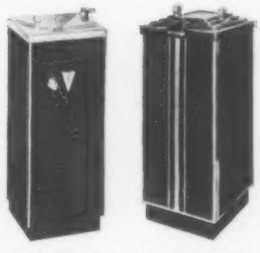
Whatever your refrigeration requirements, whatever the operating conditions, your local Westinghouse dealer can supply exactly the equipment best suited to your needs. You'll find him entirely competent to handle every refrigeration problem. Moreover, he will show you how Westinghouse **Hermetically-sealed** Units give longer, more dependable service . . . cost less to own and operate.

Get full particulars from your local Westinghouse Commercial Refrigeration Dealer, or write Westinghouse Electric & Mfg. Company, Mansfield, Ohio.

WESTINGHOUSE HERMETICALLY-SEALED WATER COOLERS

Westinghouse builds a complete line of hermetically-sealed water coolers . . . all powered with the famous Westinghouse Unit, and backed by a **5-year** Warranty on the sealed-in mechanism.

Here are unquestionably the most dependable, most trouble-free water coolers on the market. In fact, the **only** water coolers that have an hermetically-sealed mechanism, "Built-in Watchman" protection, permanent oil supply, brushless motors, many other outstanding features.



Only Westinghouse Water Coolers have the 5-year Warranty

There are twelve models from which to choose, with capacities ranging from 3 to 19 gallons an hour. Or, if you desire, you can have a circulating water system powered with Westinghouse Hermetically-sealed Condensing Units . . . equally trouble-free, dependable and economical over a long period of years.

See your local Westinghouse Dealer or write the factory for complete details.

SECTION VIII
LABORATORY DESIGN AND EQUIPMENT

SERVICING A MODERN LABORATORY—II

Issuing Supplies to Undergraduate Laboratories and Auxiliary Services

BY W. B. FOULK

Curator, Frick Chemical Laboratory,
Princeton University

IN a previous article,* the plans of having a single distributing point for laboratory apparatus and supplies, and of having several such distribution centers, were discussed. Some of the advantages and disadvantages of each system were enumerated. The writer stated that a combination of the two systems was the most advantageous for educational laboratories, provided all such delivery rooms were manned by full-time trained attendants. A description of the storage equipment, the delivery rooms, and some of the services performed in connection with them, was discussed in some detail, emphasis being given to the equipment of a central distributing point or main delivery room and services rendered from it. Lack of space prevented a description of the services performed in connection with the secondary delivery rooms in the Frick Chemical Laboratory, devoted to the servicing of the laboratories used for undergraduate instruction. The purpose of the present article is to discuss the services rendered in connection with these secondary delivery rooms, and certain auxiliary equipment contributing to the services rendered by them as well as by the main delivery room.

Delivery Rooms for Supplying Undergraduate Laboratories

All the delivery rooms are manned by permanently employed, trained attendants, which overcomes the principal objection to the operation of several distributing centers. The main delivery room, previously described in some detail, is situated on the first or middle floor of the laboratory. It furnishes supplies to all the advanced courses, including Quantitative Analysis and Physical Chemistry, in addition to all the laboratories used for research. The delivery rooms on the ground and second floor, as well as the main delivery room, are served by laboratory attendants devoting full time to each of them and the undergraduate laboratories which they serve. In this way, responsibility for the up-keep of stocks and maintenance of satisfactory service can be demanded and obtained. Only items of chemicals and apparatus required for the respective courses taken care of by these delivery rooms are obtainable from these distributing points.

The students' desks are equipped with only such articles as are generally used throughout the year. Apparatus required for individual experiments is issued on temporary order, on the day the experiment is performed, and must be returned immediately to the delivery room upon completion of the experiment. When the students pursuing the course are divided into several laboratory sections, this method requires the acquisition of only a sufficient number of such articles for the largest section rather than enough for all students. This results in the saving of the cost of a large amount of apparatus, as well as eliminating unnecessary storage, in the students' desks, of a number of items that are infrequently used, with the corresponding possibility of breakage. It also makes it easier for the students to protect the apparatus regularly required, and keep their storage units and apparatus clean and tidy.

An incentive to the student to keep his apparatus clean, as well as a protection to the bottom of the drawers and cupboards, is provided by the use of lining papers. These are of two kinds and are used in conjunction with each other. Trays, of a type of builders' paper known as Sisalkraft, are made by turning up one inch of the edges of a sheet of sufficient size so that the tray thus formed will fit snugly into the drawers, and the sides of the tray are fastened at the corners with a stationery stapler. Similar trays

* American School and University, 6th Edition, 1933-1934.

used for the shelves and the bottom of the cupboard are made with only three sides turned up. This type of builders' paper is made of two sheets of kraft paper with an asphaltum-like substance mixed with fiber between them. It resists to a considerable degree any spillage of acids or alkalies. These trays remain in the lockers and seldom have to be renewed. In the trays are placed pieces of blotting paper of a granite color now designated by one manufacturer, since we adopted its use a number of years ago, as desk lining paper. It is inexpensive when bought in large rolls, and is therefore replaced when it becomes stained or soiled.

Sets of reagents comprising the acid and alkaline solutions most frequently required are placed on suitable shelves over each working unit of the laboratory desks. As each working unit accommodates from two to four students working at different periods, one set of such reagents is sufficient for a like number of students. In General Chemistry, where such reagents are not so frequently used, a set of reagents is placed at both ends of each row of desks. In the latter case, little time is lost by the student in securing them when needed, and in both cases considerable saving is made in initial equipment and solutions; also in subsequent refilling of the bottles.

Chemicals Placed on Reagent Racks in the Laboratories

Sets of chemical salts and solutions, used less frequently for testing purposes, or more often for experiments, are placed on reagent shelves along the walls. Separate racks for "dry" and "wet" reagents, and test solutions, are provided; usually two of each to a laboratory, one on each side of the room, centrally located so as to be quickly accessible to all parts of the laboratory.

Reagent Rack

In recent years the kit or unit system of distributing chemicals has come into use. Although the writer believes some of the advantages claimed for the kit system over the side-shelf and supply-room methods are controversial, this system offers certain advantages where supply rooms cannot be conveniently located in relation to the laboratories, or the service personnel is inadequate. Under conditions described in this article the older method has been found to be both satisfactory and economical.

Tables are placed adjacent to all the reagent racks to facilitate the pouring or weighing-out of the chemicals. These tables are provided with trip scales, and paper cutters containing white drug paper, 6 inches wide, in rolls from which square pieces are easily torn for use on the scales when weighing out the chemicals. A dustpan and brush hang at each end of the table, and a student who spills any chemical is required to clean it up and put it in a convenient waste jar. 250 ml. glass-stoppered salt mouth bottles are used for the "dry" reagents, and 500 ml. narrow mouth glass-stoppered bottles for the "wet" reagents and test solutions.

The shelves of the reagent racks are spaced to give sufficient clearance in removing the bottles. They are only slightly wider than the width of the bottles plus a strip along the back of the shelf to prevent the bottles from being pushed against the back. Narrow strips (⅜-inch) with front ends beveled, of material from which the shelves are constructed, are attached vertically to the back strip, spaced a distance ⅛-inch greater than the diameter of the bottles, thus forming a square compartment for each bottle. Ebony asbestos wood is an excellent material to use for these shelves.

The compartments are numbered consecutively, the numerals being painted on by means of small brass stencils. Printed labels bearing the name of the substance and the chemical formula are placed uniformly on the bottles. If the bottles contain a solution, small strip labels giving the normality are attached to the original labels below the chemical symbol. The bottles are arranged alphabetically, and consecutively numbered labels are placed on the bottles above the identifying label. The labels are then painted with a thin coating of hot paraffin or clear lacquer to prevent soiling. The bottles, when placed on the shelves in this order, are in both alphabetical and numerical sequence. When removed from the shelf, they may be quickly replaced in their proper sequence by returning the bottle to the correspondingly numbered

compartment. A typed list, covered by glass, giving the name and number of the substance, is placed in a frame above the reagent racks, and is an aid both in locating a chemical and in identifying any that may not have been returned to their compartments.

Distribution of Chemicals for Specific Experiments

Bottles containing chemicals used only for specific experiments are placed in a special rack on the weigh-out tables, only on the day they are to be used. If comparatively large quantities of a chemical are required, or they are expensive, poisonous, or dangerous, such as cyanides, they are issued from the delivery rooms in the exact quantity required. This is especially true of most of the chemicals used in the laboratory courses in Organic Chemistry.

Service is available from these delivery rooms only during the periods when the respective undergraduate laboratories are used for instruction. The attendant is more than a storekeeper. During the hours the delivery rooms are closed, he devotes his time to seeing that depleted stocks are replaced, that apparatus and chemicals to be used for the next experiment are prepared, and conveniently arranged on the service counter for issuing. He refills the side-shelf and desk reagent bottles, preparing all the solutions needed as well as all the unknowns, and makes all the other preparations for materials and apparatus required for the courses, so that the instructors are relieved of these time-consuming and irksome tasks, leaving them free for purely instructional duties. All these tasks having been performed before the time for laboratory instruction to begin, the attendant's time can be devoted entirely to the expeditious issuing of the required supplies.

Facilities for Preparing Solutions

Adjacent to the delivery room serving General Chemistry and Qualitative Analysis, in which laboratories the largest number of solutions are used, is a solution room where the major part of the solutions used throughout the laboratory are prepared. This room is equipped with several tables with alberene tops having alberene stone hoods above them. Below these tables provision has been made for carboys of the mineral acids, a separate table and hood having been provided for concentrated and dilute ammonium hydroxide. The small bottles comprising the desk reagent sets are filled under these hoods from the carboys below them.

There are two work tables for use in preparing the solutions and for filling and labeling the individual bottles composing the side-shelf reagent sets. These tables are similar to the "weigh out" tables described in a previous article,* in which diagrams were given of the drawer arrangements. The cabinets underneath the tables contain a sufficient number of label drawers in which 342 different chemical labels 1¾″ x 3¾″ in size are stored beside the normality labels. A separate compartment, 2″ x 4″, has been provided in these drawers for each of these labels. As they lie face up and are arranged in alphabetical order, they form their own index and are readily available. The tables also contain drawers for corks of the various sizes required, and a special drawer for labeling accessories and other utensils. The tables are serviced with gas and electricity. Alberene stone shelves have been placed 20 inches above the tables, on a portion of which are placed large bottles containing the alkaline solutions included in the desk reagent sets. The small reagent bottles may be placed on the table below them and filled from the bottles by the use of glass syphons.

Between the bottling tables and the hoods are stone sinks serviced with hot, cold and distilled water. The faucets have been placed 24 inches above the bottom of the sinks to enable graduated cylinders up to 2 l, and the large flasks and bottles used in preparing the solutions, to be put under them in an upright position. Cupboards below the tables have also been provided for storing the cylinders, flasks and other utensils used in preparing the solutions.

Concentrated solutions are made of all the chemicals used for "wet" and "test" reagents and are then diluted as required to whatever normality or strength is desired. By preparing the solutions in concentrated form, a considerable saving in both number and storage space is obtained. They are stored in 5-pint glass-stoppered bottles on a large reagent rack of construction similar to those previously described, but, of course, the shelves and compartments are larger to accommodate the larger bottles. This rack, 4¾ feet wide by 11 feet high, will store 180 different solutions.

Distilled Water and Hydrogen Sulfide Distribution

The water still and hydrogen sulfide outfit are located in small rooms on balconies at opposite ends of the second-floor delivery room. The side of these rooms facing toward the delivery room is enclosed with a steel sash and glass partition, so that the equipment in the rooms can be observed by the delivery room attendant from below while issuing supplies or attending to other duties.

The distilled water equipment consists of a 25-G.P.H. steam-heated still. It is fully automatic. The distilled water is stored in a 350-gallon tin-lined cylindrical copper tank mounted horizontally on the ceiling under the still room. From this tank the distilled water is distributed by gravity through block-tin pipes

* American School and University, 6th Edition.

Second-Floor Delivery Room and Distilling Equipment

to every laboratory in the building. In the undergraduate laboratories there are two outlets in each, located on opposite sides of the room with floor drains beneath them. The outlets in the research laboratories, solution and service rooms, were placed over sinks. Very satisfactory tin-lined spring-closure faucets are used to control the flow. The type of still installed was chosen after considerable investigation, and its choice has been a source of satisfaction because of the product and service obtained from it. On a recent test it was found that the distilled water produced by the still was of higher purity than conductivity water that had been painstakingly prepared. This type of still is particularly satisfactory where the feed water contains scale-forming minerals. Owing to its design, any scale formed can be easily and thoroughly removed. Because of its construction, only condensed steam can enter the block-tin condensing tubes, so that the final product is entirely free from contamination.

Hydrogen Sulfide from Cylinders

Ours was one of the first laboratories to use compressed hydrogen sulfide gas supplied in cylinders, and because of the demonstrated advantages of this method of obtaining and distributing this reagent over the use of generators, provision was made in our new laboratory only for this method of distribution. A 12-cubic-foot gasometer was installed with a manifold on the inlet line to permit two 60-pound cylinders to be connected to it at one time, so that when one was empty, merely by closing the valve on the empty tank and opening the one on the full tank any interruption in the supply of hydrogen sulfide due to delay in changing cylinders was avoided. Provision was made for an additional unit, if required, by a manifold arrangement on the outlet side of the gasometer. This gas is distributed to the undergraduate laboratories used for General Chemistry, Qualitative and Quantitative Analysis, through 1½-inch diameter lead pipe. For Quantitative Analysis the outlets were located in the fume-hoods in the hood room. In the other laboratories they were placed in all the wall hoods in the laboratories. Because of the corrosive action of H_2S as produced by a laboratory generator, at the time this installation was planned, only hard rubber was considered a suitable material for valves and outlets, so all the shut-off valves were of hard rubber, and especially constructed hard-rubber manifolds with hard-rubber cocks were used for the outlets.

While this outfit was a great improvement over the older method of using generators, it still had some unsatisfactory features. Some of the oil used as a sealing medium was carried into the service lines by the gas, and unless care was used in filling the gasometer the sealing fluid would splash out of it. The sealing fluid apparently absorbed some of the H_2S, for there was always a certain amount of leakage, and the sealing fluid in combination with the H_2S gave a very unpleasant odor. The chief objection was due to the necessity of frequently refilling the gasometer. In order not to have to keep a constant watch over the outfit while the laboratories were being used, we attached a mercury switch to the support for the counterweight below the pulley, with stops on the counterweight chain. When the gasometer was nearly empty, one stop would trip the mercury switch, which, making contact, would ring an electric bell. When it was nearly full, the other stop would trip the switch in the opposite direction and again ring the bell. During the period when hydrogen sulfide was in greatest demand, the valve on the cylinder would be left partly open. With this arrangement, less frequent attention was required. In recent literature issued by distributors of these gasometers, it is claimed that most of the above objectionable features have been overcome, with the exception of the necessity of manual operation of the valves in filling the gasometer.

Three years ago a manufacturer of gas-pressure

regulators put on the market a regulator for hydrogen sulfide similar to those used for oxygen and hydrogen. Very conservative claims were made concerning the period of trouble-free service it would give. The only claim made for it was that some modifications had been made to the inner parts of the regulator involving the use of corrosion-resisting materials to resist the corrosive and solvent action of the gas, and that several of these gages had been under test for three years in educational laboratories and were giving surprisingly good service. Recognizing the advantages to be obtained by the use of a regulator for this gas, we decided to risk the chance of rapid deterioration of the regulator. We bought one and installed it. It has now been in constant use for 3½ years and in that time it has received no service or repairs of any kind. By the use of it, and other changes we made at that time in our system, we have overcome all the objectionable features previously experienced.

As we had no assurance at the time we installed the regulator that it would give perfect service, we decided to install it so that the control of the flow of the hydrogen sulfide from the cylinders could be instantly changed from the regulator to the gasometer without any interruption in the distribution of this gas. In order to accomplish this, a tee was placed in the inlet pipe to the gasometer with a needle valve above and below it. The regulator was then connected directly into the pipe line leading from the upper valve. Ordinary galvanized steel pipe and fittings were used for the pipe connections. The pipe leading from the regulator was connected with the manifold on the outlet side of the gasometer which had already been provided for a second unit, and in this manner the gasometer was by-passed. By means of the regulator, the pressure of the gas from the tanks was reduced to about 4 pounds to secure a satisfactory flow through the system. By use of the regulator, the delivery pressure can be varied from 0 to 40 pounds as desired. Since the regulator just described was placed on the market, another type of regulator for hydrogen sulfide has become available. It is described as an automatic expansion valve which automatically checks as excessive back pressure builds up, maintaining a constant suction pressure to within two or three pounds. The writer has had no personal experience with it, but mentions it to indicate the type of regulators that are now available.

The threads on the hard-rubber cocks to the manifolds in the hoods had given us considerable trouble, especially where they were threaded into the manifold. We therefore removed the hard-rubber manifolds and substituted wrought iron pipe for them. Fearing some corrosion might occur at the outlets, we installed needle valves of stainless steel. This alteration has proved very satisfactory and has completely overcome all the difficulties experienced with the hard-rubber equipment. As an added precaution, to prevent the students from using a too rapid flow, pieces of capillary glass tubing are placed in short lengths of rubber tubing, one end of which is wired to the outlet from the valves, the other end left free for connecting to the students' flasks.

If any reader is now using a gasometer in connection with hydrogen sulfide in cylinders, the above method of installing a regulator is desirable. If he does not already have such an outfit and is contemplating the acquisition of one, considerable expense can be saved and more satisfactory results obtained by the purchase of a regulator rather than a gasometer, as we have not used our gasometer since the regulator was installed. Without the gasometer, it might be a good policy to have a second regulator in reserve to immediately replace the first should any difficulty with it arise.

The question is often asked: "What is the relative cost between using compressed hydrogen sulfide and producing it with a generator?" Because there are so many variables in a direct comparison, it is a difficult point to determine. However, the distribution of this gas from compressed cylinders is so very much more satisfactory that, even if the cost of the gas in cylinders was greater, the elimination of the objectionable features inherent in the use of a generator, together with the saving in labor required to operate it, would more than offset any possible increase in cost of the gas secured in cylinders.

Issuing and Checking-in of Students' Laboratory Apparatus

The delivery room attendant takes charge of the actual assignment of the students' desks and equipment at the beginning of the term and the checking-in of them at the end of the course.

From a chart of the laboratory, the instructor designates the working space he desires the student to occupy. The students are informed of the unit they are to use either by posting an assignment list or by announcement in class.

The chart referred to is a diagram of the laboratory tables divided into sections representing the individual lockers, correspondingly numbered, with space for printing-in the names of the students to whom the lockers have been assigned. The necessity of making a new chart each year is obviated by making photostat copies of the original.

Each bank of work tables in the laboratory is designated by a letter, and the lockers in each bank are consecutively numbered. By this numbering arrangement, the instructor can locate quickly any student in

the laboratory, as each numbered unit occupies a corresponding place in each bank of desks; thus A-1 and B-1 lockers are both to the extreme left of the row of work tables indicated by their respective letters, and each higher-numbered locker is directly opposite the corresponding numbered unit in the other row of tables. If the instructor is standing opposite A-5 and wants to speak to a student having F-5, he knows that he will find him at the equivalent position in the F bank of tables. It is impossible to do this when lockers are numbered consecutively from 1 up to the total number of lockers in the laboratory, as is the usual custom.

As previously stated, the apparatus and equipment permanently assigned to each student are confined to items frequently used throughout the duration of the course. All of these items, together with a printed apparatus list, are in the student's storage unit under the laboratory work tables, when his position in the laboratory is allotted to him. At the beginning of the first laboratory period of the course, the student calls at the delivery room window, stating his assignment, and is promptly handed a correspondingly numbered envelop containing his locker key, platinum wire and other particularly valuable items. He locates his locker and checks the apparatus it contains against the printed list. The checking is facilitated by the items arranged in the drawers and cupboards being in an arrangement somewhat similar to the apparatus list. The list is signed by the student, and returned to the delivery room. Recognition of the items is made easier in the freshman courses by having a typical desk equipment displayed on the lecture room table, the instructor identifying the items for the students. Comparatively little time is consumed by this method of assigning laboratory space and apparatus. It is possible to conduct the first experiment on the same afternoon.

The apparatus permanently assigned to each student is divided into three classes and so designated on the apparatus lists. The first class contains all items of glassware and porcelain, with the exception of glass tubing and crucibles. Such articles may be returned at full value if clean and unbroken. The second class contains all items of metalware which are not likely to be permanently damaged by reasonable use. These are credited at 75 per cent of list price. The third class is composed of expendable materials such as filter paper, triangular files, glass and rubber tubing, and so forth. None of the latter group may be returned except at the time the equipment is received.

The students are required to check-in the apparatus assigned to them during the last scheduled laboratory period of the term. An additional apparatus list having directions for cleaning and checking the apparatus is given the student. All first-class items missing or broken must be replaced by the student before his equipment is checked, and the glassware must be thoroughly cleansed and dried. The checking is done entirely by the storeroom attendants. The instructors, however, are expected to see that the student has thoroughly cleansed the glassware and replaced the missing articles before he requests his equipment to be checked. The second-class items are collected by the delivery room assistants when the student's equipment is checked. The third-class items are not accepted for credit, but the student is urged to keep any items which are still serviceable, and to substitute them for similar ones in subsequent courses. He is provided with a paper bag in which to remove them from the laboratory, otherwise they are collected by the delivery room attendant after the laboratory period and sorted at a convenient time to save all the materials that are still in serviceable condition.

Issuing and Caring for Instruments and Special Equipment

The delivery room attendants are responsible for the physical condition of all the apparatus and equipment used in the respective laboratories served by them. The work they do in maintaining the laboratory furniture and similar equipment is extensive and valuable. The routine care of the balances, especially those used by the freshmen, is done by these men. We also have a key-bitting machine, and replacements of all keys lost are made by a member of the service staff. As there are several thousand different keys to the students' lockers, as well as a large number to the rooms in the building, considerable time and expense is saved in this manner.

Repairs to Glass Apparatus

The glassblower repairs many of the items of glassware ordinarily used in the laboratory, such as beakers and flasks with chipped rims and cracks, side tubes on filtering and distilling flasks, and many other articles. He also replaces the tubes on stopcocks, regrinding the plugs that have been scored and replacing those which have been lost. New stopcocks are put on burettes whenever the tips are broken or the plugs have been lost. When such burettes have been calibrated, their restoration results in considerable saving of time as well as expense. New stoppers and plugs are ground into separatory funnels which would otherwise have to be discarded. The number of these runs into the hundreds, as many are used in the organic laboratories. The glassblower is assisted in this work by the delivery room attendant serving the organic section. We do not attempt to have him man-

ufacture glass apparatus that can readily be purchased, but he does make many items for the undergraduate laboratories that are either used in limited quantities or are of a special nature, such as H cells, electrodes, stirrers and similar items, at a considerable saving of both time and money in securing them.

No laboratory, no matter how small, which has a service staff of one or more men, should be without a man capable of blowing glass. A number of years ago, when we did not require the services of a full-time glassblower, we arranged for one of our service men to have a few lessons in glassblowing. This same man now devotes all his time to glassblowing. He is capable now of making apparatus of intricate design, and his services are a distinct asset to the laboratory.

Glassblowing Equipment

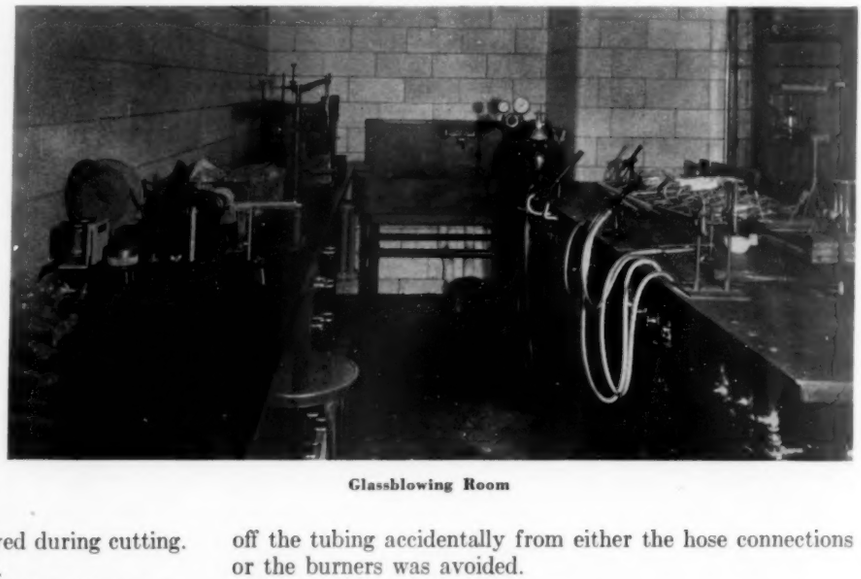
The glassblowing room is 14 x 18 feet and the equipment it contains was designed for the purpose intended. Along one wall is a work-bench with a wood top 30 inches wide by 14½ feet long by 40 inches high. Under one end of it is a steel cabinet for glass tubing 3½ feet in length. The opening to this cabinet is at the end of the table, to permit the tubing to be inserted and withdrawn easily. The shelves are spaced on 6-inch centers with dividers spaced equal distances, forming compartments 6 inches square, 24 in all, for the storage of the sizes of tubing used most frequently.

Beyond the cabinet an electric motor was mounted in an inverted position on the underside of the bench top, and the belting was brought up through it to a cone pulley attached to a small bench spindle with which a carborundum shellac grinding or cutting wheel 4 inches in diameter by $\frac{1}{32}$-inch thick is used. This wheel is for cutting glass tubing. A drip-pan has been placed under the wheel to hold fine carborundum and water. The wheel when revolving picks up the suspended particles of carborundum, and the cutting is expedited. A suitable stand has been provided for supporting the tubing in a horizontal position to the wheel, and the glass tubing is pressed against the wheel and revolved during cutting. A hot wire cutter has also been provided.

Under the bench beyond the saw is a steel cabinet containing drawers approximately 3 feet in length which are equipped with dividers to form compartments for the storage of glass stoppers, plugs and other items used in glassblowing. The remaining 6 feet of the bench is used for glass-grinding equipment which includes a drill press, a grinding lathe and a lapidary wheel. These are driven by a drive-shaft under the bench, and power is furnished by an electric motor. Cone pulleys allow variation in speed, and foot pedals permit intermittent operation of the equipment, as is required in glass-grinding operations. A generous-sized stone sink has been provided for washing the glass tubing as well as the glass apparatus after grinding. It is 2 feet wide by 4 feet long by 8 inches deep. It is serviced with hot and cold water through a mixing faucet with a swinging spout.

On the opposite wall from the work-bench is a large steel cabinet with glass doors. Here are stored articles in the course of construction. Its principal use, however, is for the storage of specially constructed glass apparatus after the person for whom it was made has finished with it. The glass doors permit it to be easily seen and persons requesting an article of special design to be constructed are requested to see whether the case contains anything that they could use instead. Most of the items which would otherwise never be used again are put into service. As a proof of this, the cabinet is never filled. Provision is also made along this wall for an electric annealing oven for annealing the larger items of glassware constructed by the glassblower.

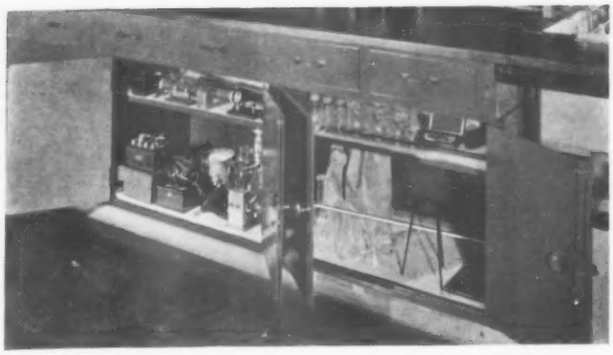
The glassblowing table is situated in the center of the room with free passageway around it on all four sides. The table top is 3½ feet wide by 10 feet long, covered with transite. The table is of angle-iron and pipe construction. Gas and compressed-air lines were brought up under the table and were connected to service lines extending along the underside of the table top 3 inches from the edge. A third line was also placed in a similar position, and provision made for connecting it to an oxygen tank placed at the end of the table. Needle valves with hose connections were inserted in these lines, and holes were drilled at intervals in the table top above them for rubber tubing connections to the various burners. In this way the possibility of pulling off the tubing accidentally from either the hose connections or the burners was avoided.



Glassblowing Room

Care and Maintenance of Expensive Apparatus

The care and maintenance of expensive apparatus used in the advanced courses and in research presents a problem in any laboratory. Because of the number of such items used here in research, we have special storerooms for them. Each instrument has a permanent number, and a card record correspondingly numbered is kept in the writer's office in a "visible" record file containing complete information concerning each one, its location in the storeroom or if in use where and by whom, and other information that assists in



Interior of Students' Lockers for Physical Chemistry

securing the maximum service from each article as well as permitting them to be secured with the minimum of effort by the individuals requiring them.

Where a number of instruments are required by a considerable number of students, as in the Physical Chemistry Laboratories, a problem is presented in meeting their requirements without an undue investment in instruments and with a minimum expenditure of the instructor's and student's time in securing them when needed. It has been an inflexible rule of this department that the undergraduate's requirements for instruments and apparatus precede those of all others. All these conditions have been met in the following manner.

The students perform their experiments in pairs. The apparatus is divided into two divisions. Two students are assigned to one locker containing the glassware and other items commonly used in all laboratory courses, such as beakers and flasks. A locker, between those assigned to each group of two students, is equipped with what we term a Special Physical Chemistry Desk Equipment. In this locker are placed the electrical instruments such as galvanometers, potentiometers, resistance boxes, standard cells and all accessory equipment, as well as Beckman freezing point apparatus, Victor Meyer apparatus and items of glassware used for single experiments during the course. A key to the locker is attached to a block of wood and placed in each of the lockers assigned to the two groups. In this way, one of each of the various instruments suffices for four students, the equipment is readily available, and the responsibility for the care and proper use of it can definitely be placed. If an instrument is damaged, the cost of its repair is assessed to the student causing it. It is a rare occasion when the student will not acknowledge his responsibility for the damage. In such an event, the cost is prorated among the four. Conflict in the time for using the special equipment is avoided either by dividing the class into two sections which use the laboratory on different days, or by alternating the experiments between the two groups.

We are fortunate in having steel laboratory furniture, the lockers of which are practically fume-tight, so that the instruments can be stored in them as safely as in the cabinets in the special storerooms. Duplicates of the lists of special equipment contained in the common locker are signed by all students comprising the two groups. One is kept on file by the delivery room attendant, and the other is left in the locker. A column is provided on the lists for crediting the return of each individual item, so that if an instrument is needed elsewhere in the laboratory, proper credit may be given and it may be removed, but the removal of any instrument is permitted only after all the experiments requiring its use have been performed. All instruments so removed must be returned to their respective lockers before the beginning of the next course.

When the course is completed, the special equipment is checked in the same manner as that in the individual lockers. All missing items are accounted for or replaced. At a convenient time after completion of the course, all the instruments and special equipment are inspected and repaired. If any serious damage has occurred to the instruments, they are returned to the maker for repairs as soon as it is discovered. Minor repairs are made by our own service staff. Such repairs include cleaning contacts, refinishing instrument cases, cleaning and oiling motor stirrers, and a general restoration of all articles to serviceable condition. The thermostat baths and other special equipment in the laboratory are also maintained and kept in working order by the service personnel.

Reconditioning Laboratory Apparatus of Metal

During the vacation periods all used metal apparatus is repaired and reconditioned by the delivery room attendants. A metalware reconditioning room has been provided for this work. In addition to a drill press and other machine tools, equipment for cleaning and applying protective finishes to metal apparatus has been provided, and the appliances used for this purpose may be worth mentioning.

A battery of three tanks has been installed including two cylindrical steel tanks 20 inches in diameter by 20 inches deep, supported in cylindrical steel jackets or tank heaters and heated by gas. A solution of hot caustic soda is used in the first, and hot dilute sulphuric acid in the second, which is lined with sheet lead. The third is a cylindrical water bath of monel metal, and all three are connected by a drip-pan of the same metal. The various small parts of the metal laboratory apparatus are placed in a cylindrical dipping basket of suitable size, so that it and its contents can be immersed, first in the hot caustic soda to loosen the old enamel finish, and second, in the hot dilute sulfuric acid solution for the removal of rust and to neutralize the caustic. The basket is next trans-

ferred to the water bath, where the parts are thoroughly rinsed. It is then dropped on a monel metal drainboard. The transfer of the basket in each of these operations is accomplished by means of a chain hoist and trolley. The various items are then removed from the basket and placed in a galvanized iron drying oven. After this treatment the substances still adhering to the metalware are in the form of a dry powder and are quickly and easily removed by the use of an electric buffing lathe equipped with circular wire brushes. A good, clean surface is thus obtained.

The metal parts are now dipped in rectangular enameling tanks containing chemical- or heat-resisting enamels, according to the type of equipment. The enameling tanks of monel metal are 14 inches wide by 37 inches long by 8 inches deep, set in a table 37 inches in height. Tanks of these dimensions were determined to be adequate to permit the dipping of all the various sizes and shapes of metalware normally used in the laboratory. Above each of the dipping baths were placed two racks of angle-iron construction, with the angles placed across the ends of the baths to support rods on which the various articles are hung to drip after dipping. The enamel is then baked on in an indirect fired gas enameling oven. A fine, hard enamel finish is thus obtained which will withstand several years of hard usage in the laboratory. A second angle-iron frame was provided, to which the rods on which the metal parts are suspended could be transferred after dripping had ceased, until a sufficient quantity of them had been accumulated to permit the oven to be fully loaded so as to keep it in almost constant operation. More satisfactory and rapid results are possible by this method of cleaning at a small expenditure of labor than by the usual tumbling barrel method.

Metalware Cleaning Room 1.—Cleaning and Dipping Equipment

Metalware Cleaning Room 2.—Baking Oven and Drying Racks

Brass parts are refinished by first dipping them in dilute hydrochloric acid to clean them. The acid is contained in a cylindrical chemical stoneware jar 15 inches inside diameter by 19 inches deep, having a capacity of approximately 15 gallons. This jar is set in a supporting frame, and it is provided with a lead drip-pan. A cover is also available for covering it when not in use. The brass parts are placed in a cylindrical copper wire dipping basket 13 inches in diameter by 18 inches deep, provided with a bale handle and immersed in the dilute hydrochloric acid. After rinsing and drying, they are placed in a smaller wire basket and dipped in clear lacquer in an enameled kettle. While lacquer cannot be as evenly applied in this manner as by dipping each piece individually, a satisfactory coating is obtained. They are then placed on a wire screen in the oven to dry.

This equipment has been found to be a source of real economy, as the life of the various metal apparatus is prolonged indefinitely; otherwise a considerable part of it would have to be discarded each year, incurring the expense of replacement. An additional advantage is that each student is provided with apparatus equal to new. The appearance of the laboratory is greatly improved by the absence of dirty, rusty metalware, and the student has an added incentive to do more careful work.

The reader may think that this outfit is too elab-

orate for his own requirements, or he may be deterred from installing similar apparatus because of the expense involved. Equipment was selected and installed in our present laboratory with the idea of permanence. However, when this method of reconditioning our metalware was first started some fifteen years ago, the utensils were the least expensive obtainable. The caustic pot was an enameled preserving kettle, the acid tank an old chemical stoneware jar, and the water bath was made of a heavy-gage cylindrical utility can. The dryer was a wire screen, and the baking ovens were old single wall galvanized iron drying ovens such as are listed in any laboratory supply catalog and are likely to be found in any of the older laboratories. All these were heated by means of Fletcher radial burners. The buffer was a simple bench spindle. Old cans were first used for dipping baths. Later, tanks of more suitable size were made of galvanized iron and set in old wooden benches for greater convenience in use. Good results were obtained with these crude implements, but they were all gradually replaced with more efficient equipment over a period of years, from savings made from funds that otherwise would have had to be expended for replacements of the apparatus discarded if this process of reclamation had not been adopted.

Apparatus Constructed in Machine Shop

Articles requiring more extensive repairs than it is practical to make in the metalware conditioning room are repaired in our machine shop. Items of apparatus used in the undergraduate laboratories which are not readily obtainable or can be made to better advantage are manufactured in our own shop. A few of these are constant-temperature baths and vacuum tube relays for use with them, bottle racks, dryers for glassware, and stainless steel rods for supports.

The last two items may be of more than passing interest. A simple but effective drier for inside surfaces of glassware is made by coiling $\frac{3}{8}$-inch diameter flexible copper tubing into a coil having a diameter of 3 inches. Four or five coils are made with a 6-inch length of straight tubing left at one end and approximately 18 inches on the other. The longer length is bent at right angles to the coiled portion. The drier is then mounted on a support stand by a clamp with the short end of straight tubing at the bottom. This is connected by rubber tubing to a compressed-air cock. The compressed air passing through the coiled tubing is heated by a Bunsen burner equipped with a crown top which is placed under the coil. The article to be dried is suspended over the longer straight tube, and the rapid current of hot air quite rapidly dries the moisture adhering to the inner surfaces of the article suspended.

Many types of coatings have been applied to ring stand rods. Some are now furnished copper-plated. We found that the steel rods soon rusted even with this protection. When stainless steel became available, we decided to try this material for support rods. We selected Allegheny metal and have been making rods of this material now for a period of years, and are gradually replacing with them the rods on all our supports. The rods of this material are affected only to a slight degree by the fumes in the laboratory. The few which do rust under unusually severe conditions of use can be buffed and repolished without difficulty. An improvement in the rods is also made by inserting a 3-inch length of $\frac{3}{16}$-inch diameter stainless steel rod through the $\frac{1}{2}$-inch diameter support rod 1 inch above the threaded end. This provides a finger hold so that the rods may be inserted into and removed from the bases without the use of wrenches or pliers. This arrangement is especially useful in the undergraduate laboratories, as the rods can be removed easily from the bases, and it permits their being stored to better advantage in the students' lockers. The initial cost of the stainless steel rods is from two to three times that of ordinary steel ones, but this difference in cost is more than offset by the longer life and superior service they give.

Lecture Preparation Room

There are two lecture preparation rooms in the laboratory. They are similarly equipped except that the equipment in the larger of the two, situated directly back of the auditorium, is more extensive. Apparatus used for lecture demonstration is assembled and set up as well, as the materials used for this purpose are prepared by a full-time member of the service staff.

The larger of the preparation rooms is 10 x 36 feet. It is a comparatively small room for its purpose, but has been found adequate because of the equipment provided and its arrangement. All four walls were utilized for it, with the exception of space for a door at each end opening into the auditorium, and one on the opposite wall leading into the main delivery room that permits supplies to be secured quickly as well as affording entry to the preparation room without passing through the auditorium while a lecture is in progress. Adequate and diffused daylight is provided by a skylight.

In the center of the wall between the preparation room and the auditorium is a large fume hood 3 feet wide by 8 feet long. It contains a small sink. In addition to water and gas, outlets have also been provided at each end of the hood for 110/220-volt alternating current, and for direct current of variable voltages from 2 up to 110 volts. This hood is useful for a number of purposes. A sliding blackboard on the

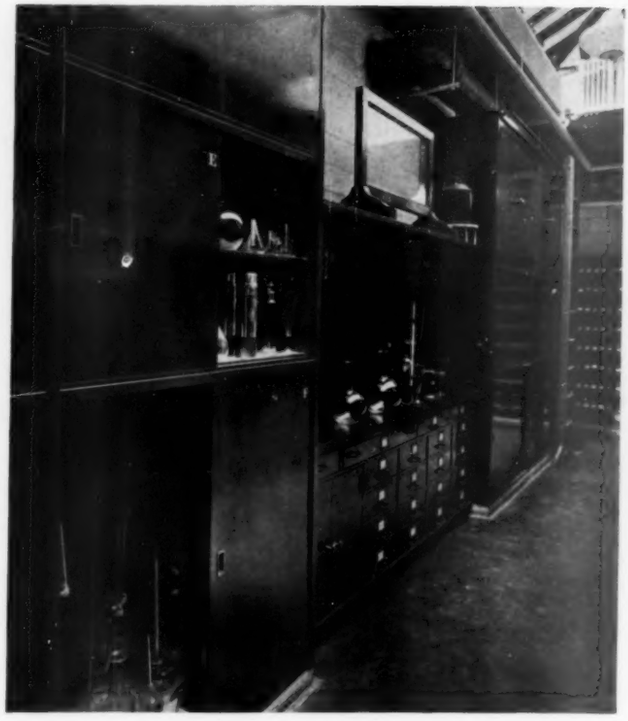
auditorium side can be raised to permit securing or disposing of fuming materials by the lecturer, and for other uses of the hood. It also can be used for setting up parts of apparatus to be used in the lecture immediately following the one in progress, from where it can be transferred quickly to the lecture table.

The idea of having part of the lecture table movable on tracks to and from the auditorium to the preparation room was considered, and was abandoned because such an arrangement seemed to be too cumbersome for the advantages obtained. The use of the hood as outlined helps to offset the advantage afforded by a mobile section of the lecture table, and any further advantage offered is secured by the use of movable tables mounted on rubber-tired swivel casters provided with brakes. These tables are easily handled and require little space for manipulation. When the brakes are applied, they are quite rigid. Complicated set-ups can be made on them in the preparation room, after which they can be wheeled into place at the ends of the permanent lecture table.

Sections of steel drawers have been placed under the hood on the preparation room side for storage of articles used in preparing lecture demonstrations. The sizes for these drawers as well as those in the workbench were selected after actual tests had been made to determine the sizes most suitable for the storage of materials used for lecture demonstration purposes. All the drawers are 30 inches deep. Those in the top row are 3 inches high, one being 36 inches wide, and two 18 inches wide, for items of considerable length, such as glass tubing, burettes, and condensers. The other drawers are 15 inches wide by 5 inches high. All of them may be divided into numerous divisions, the sides and ends being slotted for dividers.

The hood is flanked on both sides by steel cabinets specially designed for the storage of apparatus used in lecture demonstrations. The cupboards are covered by sliding doors. The height of the cupboards in the lower section of both cabinets is 48 inches and 36 inches respectively. They are used for lecture apparatus of exceptional height permanently mounted on support stands. The middle section of the cabinet to the left of the hood is 3 feet in height, for the storage of such tall items as gas-collecting and large graduated cylinders. The upper sections of both cabinets are provided with adjustable shelves for the storage of instruments and glassware of nominal height.

The middle section of the right-hand cabinet has no divisions. It is 2½ feet high by 8 feet long by 2 feet deep. The bottom of the cupboard is covered with a chemical-resistant material. This cupboard was designed as a temporary storage space for assembled parts of a lecture set-up used in connection with a lecture that is repeated on two or more days of the same week in order to reduce the time required in repeatedly setting up such apparatus.



Preparation Room 1.—Storage Cabinet and Fume Hood

The equipment on the opposite wall consists of a standard open-front fume hood adjoining which is a generous-sized stone sink 2 feet by 3 feet by 10 inches deep, serviced with hot, cold and distilled water. On the other side of the sink is an 11-foot chemical table with alberene stone top and shelves of similar material above. Below the table are steel drawer and cupboard sections for the storage of apparatus and utensils used in preparing materials for the lecture demonstrations. Floor space was conserved by providing a knee space and drawers at the right end of this bench for use as a desk. One of these drawers is a file drawer for 5 x 8-inch cards.

To the right of the chemical table is another steel storage cabinet. The upper shelving in this cabinet is equipped with adjustable shelves on which exhibits are stored. The shelves in the lower part are spaced on 12-inch centers in which 60 fume-tight hard-fiber boxes 10¾ x 11¾ x 24 inches deep have been inserted. These boxes are of especial interest. There is a separate box for each lecture, in which all the smaller articles used for that lecture are assembled. These include beakers, flasks, glass bends and many items used in setting up the lecture apparatus, so that it is unnecessary to hunt around for them or provide new ones each time the lecture is set up. Minute directions with diagrams and listings of all the articles and parts required appear in a loose-leaf lecture prepara-

Preparation Room 2.—Work-Bench and Shelving, Showing Lecture Boxes

tion book. Each box is numbered to correspond to the number of the lecture in the book. Each box also has a card holder on which the number and name of the various experiments comprising the lecture are designated, so that it is possible for any one other than the lecture preparation man to set up a lecture without difficulty.

The 5 x 8-inch drawer file in the desk section of the chemical table was provided with the idea of transferring the directions for preparing lecture demonstrations from the book to file cards, this being considered a more flexible method of making the information available as well as permitting revisions to be made more easily. This has been done already by one lecturer, with marked improvement over the lecture-book method. Different-colored cards comprise the set for each lecture. Buff cards are used for listing the parts and directions for setting up each experiment and are subnumbered. Where chemicals or materials must be prepared in advance of the time for setting up a lecture, a card of vivid color is used to draw attention to this fact. Directions for performing the experiment are typed in capital letters after the directions for preparing it. Exhibits used in connection with the lecture are typed on blue cards and are designated by a letter. Lantern slides with their file number are listed on a white card. The lecturer selects the cards for the particular experiments he wishes to demonstrate, and also designates the exhibits and lantern slides to be used. He gives these cards to the preparator, who after preparing and setting up the experiments places the corresponding card on the lecture table by it. This enables the lecturer to check rapidly over the set-up before the lecture. During the lecture the brief capitalized directions remind him how the experiment is to be performed and what reaction will take place, without his having to pause to orient the apparatus with the experiment.

All the available space along the walls of the two short sides of the room was utilized for reagent racks. The one for dry reagents contains compartments for 162 salt mouth, glass-stoppered bottles, and the other 189 compartments for solutions. The lower shelf of the "wet" reagent rack was made wide and tall enough to accommodate 5-pint bottles of the mineral acids. The bottles are kept properly labeled and filled and present a uniform appearance. They are used as exhibits and as containers for the chemicals that are used in demonstrations.

Conclusion

An attempt has been made in this article to demonstrate that the money expended for a service staff composed of trained assistants employed full time pays dividends in efficient operation of the laboratory, and conservation of equipment and supplies, as well as reducing to a minimum the time and attention required of the faculty for purposes other than for instruction. While no effort has been made to describe minutely all the services performed in connection with the undergraduate laboratories and the equipment used for this purpose here, the writer has tried to describe many of the services and facilities in sufficient detail so that the information may enable others to install similar services in their laboratories if any of the methods outlined appear to have enough value. He does not claim all of these ideas to be original, for he has made a practice of observing how services are performed in other laboratories whenever the opportunity was afforded, and has frequently adapted ideas obtained in this manner to the conditions existing in the laboratory he serves.

All the photographs used in this article, with the exception of the one showing the second-floor delivery room and the distilling equipment (page 439), are by F. M. Demarest, New York City.

LABORATORIES IN THE RICKETTS BUILDING, RENSSELAER POLYTECHNIC INSTITUTE

Rensselaer Polytechnic Institute has recently completed a new building to house the Departments of Metallurgical Engineering, Chemical Engineering, and Aeronautical Engineering. This building, costing approximately half a million dollars, is the latest addition to the Campus Quadrangle. Its equipment, which includes many large working units such as are used in industrial plants, represents the most approved practice.

Metallurgical Laboratories

BY MATTHEW A. HUNTER

Head, Department of Metallurgical Engineering

THE laboratory for General Metallurgy includes facilities for the melting of metals and comprises a Detroit rocking arc furnace, a high-frequency Northrup, a low-frequency induction furnace, and a vacuum furnace of the Arsem type. For the fabrication of metals after melting, a rolling mill, a swaging machine and a drawing bench are provided. Heat treatment of metals after fabrication is carried on in a Glo-bar furnace, Leeds and Northrup hump furnace; and for tempering and electrically heating, a

ABOVE—POURING INTO A LADLE IRON WHICH HAS BEEN MELTED IN A ROCKING ARC FURNACE

The electrodes which carry the current and provide the heat for the melting may be seen extending through the end of the cylindrical drum. In the foreground is a sand mold into which the metal is to be poured

BELOW—HEAT-TREATING A PIECE OF METAL

The heat-treating furnace can attain temperatures of 2500° F. The recording controller against the wall on the right not only maintains the temperature of the furnace but also provides a continuous record throughout the operation. The students are withdrawing the metal which has been heated and are checking its temperature by means of an optical pyrometer

MELTING METALS IN A HIGH FREQUENCY FURNACE

During the melting the crucible which stood on the small stand at the right of the picture was supplied with electrical energy from the unit in the rear. The student in the center, who has taken the crucible off the stand, is pouring its molten contents into the metal mold on the floor. At the same time the student on the left is measuring the white-hot liquid metal by means of an instrument known as an optical pyrometer

salt or lead bath is available.

For the metallographic examination of metals, special rooms are provided for the rough polishing and the fine polishing of metals. The room for microscopic examination, which is adjacent to the fine polishing room, contains 14 microscopes with lighting accessories, and table and drawer space for holding the specimens for examination. In an adjacent room pictures may be taken on a metalloscope, and darkrooms adjacent to this are provided for the development of the pictures obtained.

A special room is set apart for the experiments in physical metallurgy. The apparatus includes tensile testing machines for determining physical properties of metals, and electrical and magnetic apparatus for determining these properties.

There are also special rooms for the x-ray examination of metals, both with regard to the penetration of heavy specimens and for finer measurements in electron diffraction in determining metallic structures.

Laboratories are provided for electrochemistry and electrometallurgy. In these the applications of chemistry and electricity are treated in relation to the recovery of metals from solutions.

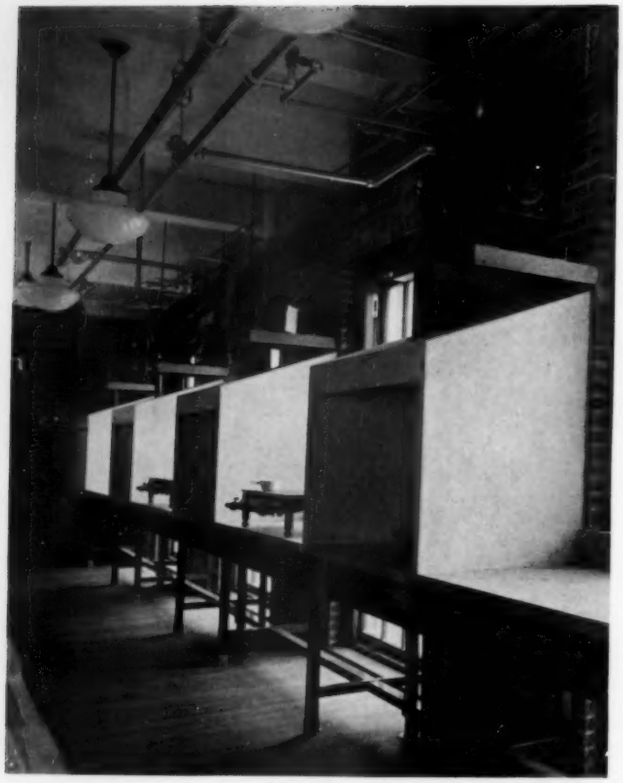
Chemical Engineering Laboratories

BY ALBERT W. DAVISON

Head, Department of Chemical Engineering

A PORTION of the space assigned to chemical engineering houses the Industrial Chemistry Laboratory and the Chemical Engineering Laboratory.

The Industrial Chemistry Laboratory was designed to handle 64 students. The desks and lockers are of modern steel construction. The desk tops, reagent shelves and hood counter are covered with alberene stone, and alberene stone is used in all the sinks and in the rooms which adjoin this laboratory. The desks are provided with gas, water, steam, low-pressure air, vacuum, 110-volt ac and 110-volt dc outlets. The fume hoods have individual exhaust fans.



FUME HOODS IN THE INDUSTRIAL CHEMISTRY CONTROL LABORATORY

Immediately adjacent to the Industrial Chemistry Laboratory are chemistry apparatus and instrument rooms. There is also a constant temperature, constant humidity room which also serves as a dark-room, and a large conference room. Four research rooms, each accommodating four students, and each completely equipped with steel desks, alberene tops and all the facilities previously enumerated, are available for research work and advanced study in industrial chemistry and chemical engineering.

A stairway leading to the Chemical Engineering Laboratory on the floor directly beneath furnishes ready access from one laboratory to the other, the chemical engineering machines located in the lower laboratory being used as the plant, and the laboratory as the control laboratory for industrial chemistry projects.

In the Chemical Engineering Laboratory are found small-sized industrial units for crushing and grinding, classifying, drying, filtration, evaporation, nitration, centrifugal separation, fusion, and similar unit operations, together with equipment for the study of the flow of heat, flow of fluids and gases, gas absorption distillation, fractionation and humidification. A heavy chemical storage room and a tool-room are located off this laboratory, and the departmental shop, equipped and in charge of an able mechanician, is on this floor.

Photographs on this and the next page by courtesy of the General Fireproofing Co.

INDUSTRIAL CHEMISTRY CONTROL LABORATORY

INDUSTRIAL CHEMISTRY RESEARCH LABORATORY FOR GRADUATE STUDENTS

Aeronautical Engineering Laboratories

BY PAUL E. HEMKE

Head, Department of Aeronautical Engineering

THE aeronautical engineering laboratory consists of three main divisions as follows:

1. The aerodynamics and fluid mechanics laboratory
2. The engine laboratory
3. The aircraft structures laboratory

The aerodynamics and fluid mechanics laboratory contains at present three wind tunnels:

a. A wind tunnel, 14.4 inches by 9.6 inches with windspeeds up to 90 mph. This tunnel may be used as an open or closed working section tunnel. The tunnel is used for elementary laboratory instruction, calibration of instruments, etc.

b. A "smoke tunnel" with a working section 1½ feet square. Titanium tetrachloride is used to generate smoke, so that flow may be studied visually. Flow-around flat plates, cylinders, spheres, automobiles, airfoils, smokestacks, bends, poppet valves, etc., may be studied to advantage in this tunnel.

c. A Goettingen wind tunnel, 6 feet x 4 feet, with an air speed of 150 mph, while operating as a closed working section tunnel. It may also be operated as a partially open working section tunnel. It is used to study characteristic laws of air flow and to make fairly reliable quantitative measurements of aerodynamic forces on various types of bodies.

The engine laboratory is equipped with a "club-propeller-test" stand for moderate-size air-cooled engines, a water brake test stand with a blower for air-cooled, in-line engines, and an electric dynamometer of a conventional type. A magneto test stand and various types of older as well as modern engines used principally in aircraft.

The aircraft structures laboratory is not at present equipped with apparatus for test purposes, except that it contains a modern 6-passenger cabin airplane which will be used to study deflections and stresses in an airplane under typical loading conditions. Apparatus to be placed in this laboratory will be especially designed to study structures used in aircraft of all kinds.

PENDLETON HALL, WELLESLEY COLLEGE

BY ELIZABETH BRADSTREET WALSH

PENDLETON HALL, the newest structure on the Wellesley College campus, was the crowning achievement of Ellen Fitz Pendleton, late President of the College. After fire destroyed almost the entire College plant, in 1914, President Pendleton directed the energies and resources at her command toward the erection of a beautiful and unified New Wellesley. One after another, seventeen dormitories, lecture halls and laboratories have risen upon the campus hills and with judicious landscaping and planting have become integrated parts of "The College Beautiful."

The cornerstone of the science building, designed to house the Departments of Chemistry, Physics and Psychology, was laid late in 1934, twenty years after the fire; the building was ready for occupancy in September, 1935, and on October 19, the twenty-fourth anniversary of Miss Pendleton's inauguration as President of Wellesley, the trustees gave it her name.

The physicists left the cramped quarters they had been sharing with the geologists in the service wing of College Hall—all that the fire had not touched of the great building opened in 1875 to the first Wellesley students. The chemists moved out of the box-like frame structure erected in 1894 as their temporary home. The psychologists came down from the shabby little society house which students had abandoned as

not fit for social gatherings. They moved into quarters spacious, well-lighted, convenient, completely equipped. Not that this attainment was a surprise to any of the faculty; most of them had helped for years in its preparation—submitting plans for the ideal arrangement, then adjusting them to fit the requirements of a budget that had been battered by many demands.

Pendleton Hall, like the other units in the plan, is Collegiate Gothic in style, modified to serve the needs of the sciences. It is of water-struck red brick, trimmed in Indiana limestone, and is designed to fit the contours of the hill from which it rises. Like a long, flat V open on the south to the leafy beauty of Norumbega Hill, it extends west of the north corner of the administration building, Green Hall, balancing Founders Hall on the other side of the hill. Behind it are rolling meadows with a small brook.

The reinforced concrete in the building walls is covered with brick selected after a series of tests for quality and rate of absorption, strength and homogeneity. The mortar was developed especially to suit the particular brick thus chosen, assuring the builders that the differential shrinkage would be as low as possible. Prof. Walter Charles Vose, Professor of Building Construction at the Massachusetts Institute of Technology and an authority on masonry materials, gave the College the benefit of his expert advice in this problem. The roof is of steel with wood sheathing back-plastered. Inner partitions are made of light-buff, semi-glazed tile, called Travablock, which requires no paint. The casement windows are placed high in the walls and are so numerous that every room is more than sufficiently lighted.

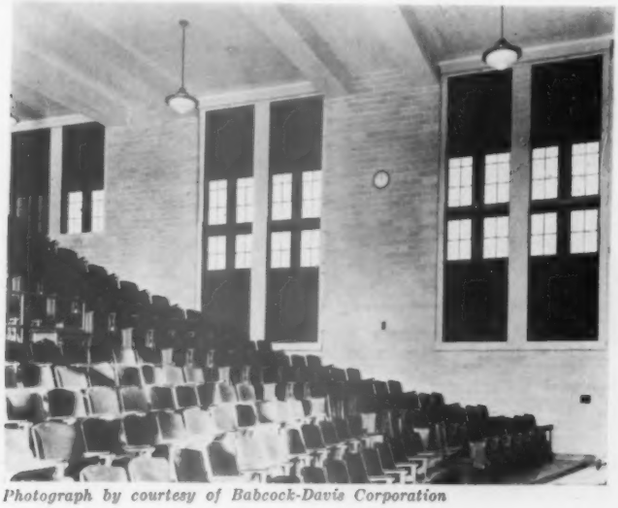
The hall is fairly narrow, and because of the elevation of the hill the floor levels are staggered, providing an extra floor on the east wing. The first two stories of this wing are occupied by the Department of Physics; above are the laboratories for experimental psychology. The west wing of the building is devoted to chemistry.

The exterior is simple in detail, broken only by the large window areas and high-peaked gables. There are three main entrances, one approached by an outside stair, which depend chiefly on the lines of the Gothic arch for beauty. The only stone carvings appear over the doorways to the Chemistry and Physics wings. Over the Chemistry entrance is an adaptation of a sixteenth-century sulphuric acid still, found in a Spanish manuscript, and above the Physics door appears a carved representation of the balance with which Otto von Guericke first proved that air had weight. On the back of the building are carved the alchemist's symbol of gold, for the Chemistry Department, and a snowflake near the meteorology laboratory on the Physics side. Students in the Art Department contributed the designs for the carvings.

Between the two wings is a large lecture hall, seating 400 people and designed for the use of all departments of the College. The arrangement of the seats in the hall gives everyone an equally good view of the lecture tables at the front. The ceiling is acoustically treated. The equipment for the hall includes a 16-mm sound moving-picture projector, and a projector for lantern slides and opaque pictures; the white wall behind the motor-driven blackboard serves as a

Left—A Demonstration Set-up in the Large Lecture Hall, Showing the Motorized Blackboard, the Electric Panel, the Illuminated Voltmeter and Ammeter

Below—Motorized Shades in Halfway Position



Photograph by courtesy of Babcock-Davis Corporation

"silver screen." The window-shades are likewise motorized. Above the blackboards are an ammeter and a voltmeter with illuminated dials, and to the right is an electric panel which distributes current to the lecture tables from the main distribution board in the basement. The lecture tables are fitted with gas, water, compressed air and vacuum connections and are of acid-proof finish.

The Physics Department

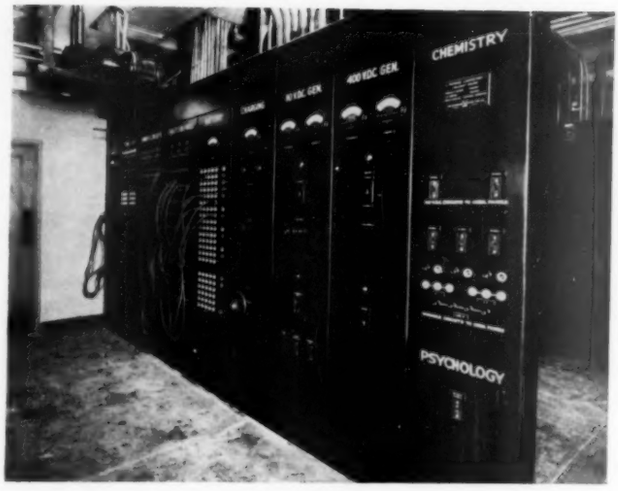
In planning the quarters in the Physics wing, Dr. Louise McDowell, head of the Department, says:

"We remembered that human beings are more precious and less replaceable than equipment, and also that physicists should lead the way in applying the discoveries physicists have made. For the comfort of students and staff, all lecture rooms and classrooms, corridors, offices and certain laboratories have ceilings of acoustical tile. In lecture rooms and classrooms there are posture chairs which are pronounced really comfortable by nine out of ten users. Forced ventilation removes one excuse for falling asleep. Dim lights permit the taking of notes when pictures are being shown: at other times ample light without glare lessens eye-strain. Motor-driven blackboards and shades make the lecturer's life easier. An intercommunicating telephone system with seventeen stations saves many steps. In convenience of arrangement and comfort, the building more than fulfills our expectations."

The ground floor on the Physics side contains machine and wood shops, in charge of a mechanician, seven research rooms, photographic dark-rooms, a glass-blowing room, a small preparation room, the switchboard, generator, transformer and battery rooms, and three advanced laboratories. One of the latter, devoted to the course in automobile mechanics, contains the ancient truck chassis, installed for years in the erstwhile potato cellar of College Hall. On the first floor are two offices, a library, a staff room and two lecture rooms and three classrooms grouped around a central apparatus room. The largest lecture room seats 75 people, and except for the sound motion picture projector contains all the equipment provided for the main lecture hall. On the second floor are the laboratories for elementary physics, meteorology, optics and electricity, with connecting offices.

The centrally located apparatus room is but one evidence of the thought for convenience and detail that preceded the erection of Pendleton Hall. Miss McDowell describes it thus:

"The receiving and unpacking room is directly underneath the main apparatus room and adjacent to the elevator shaft, which has doors opening into both rooms as well as into the corridors. The apparatus room connects the two lecture rooms and is directly across the corridor from the three classrooms. The apparatus case, fitted with glass sliding doors, has adjustable shelves extending out from the wall, separated by wide floor spaces, so that tables



The Main Distributing Board in the Basement Sends Electric Current Wherever It Is Needed

can be rolled directly to the shelves. Dome lights give excellent illumination. The laboratory apparatus is housed in a small, similarly arranged apparatus room on the second floor, and in cases in the laboratories, where it is readily accessible."

The flexible electrical distribution system which supplies current for all the departments is centered in the basement of the Physics wing. From the main distributing board, numbered lines run directly to all ground-floor rooms and to five panels supplying lecture rooms, classrooms and laboratories, whence connections are run to individual stations where current is to be used. Generators supply 110 and 400 volts dc, 115 volts ac, and 230 volts, 2-phase ac; three storage batteries furnish constant voltages in steps of four or six to 24 volts, two volts to 120, and 12 volts to 720. Time signals of 1 sec., 10 sec., etc., can be transmitted to any room. Provision is made for the later installation of a 1,000-cycle oscillator.

Lecture tables are provided with gas, compressed air and vacuum connections, ground wires, and 110-volt a-c receptacles as well as the multi-potential outlets. In addition there are receptacles connected to the 110-volt generator through a fixed rheostat, for the direct connection of small arc lamps. One novelty is a sink in which the disappearing pantry cocks are so placed that there is a clear height of 5 inches above the cocks, into which fits either a removable electric heater with an open wire mesh top to dry the apparatus used in electrostatic experiments, or an illuminator with ground-glass top.

In the corridor opposite the meteorology laboratory are installed an anemograph to give a continuous record of the direction and speed of the wind, and a recording mercury barograph. A Foucault pendulum shaft utilizes a waste corner in the stair halls.

The Psychology Department

In the quarters of the Psychology Department on the third floor of the Physics wing are custom-built laboratories designed to create and control conditions for research projects in the psychology of the senses.

Wellesley is a pioneer in the study of olfactory sensitivity, and the "smell room" is consequently a feature of the laboratories. The room is ventilated above and below to remove both light and heavy gases, so that the experimenter is able to sniff unadulterated odors, receiving new olfactory stimuli through a special hood installed in the room, while the air around her is being deodorized.

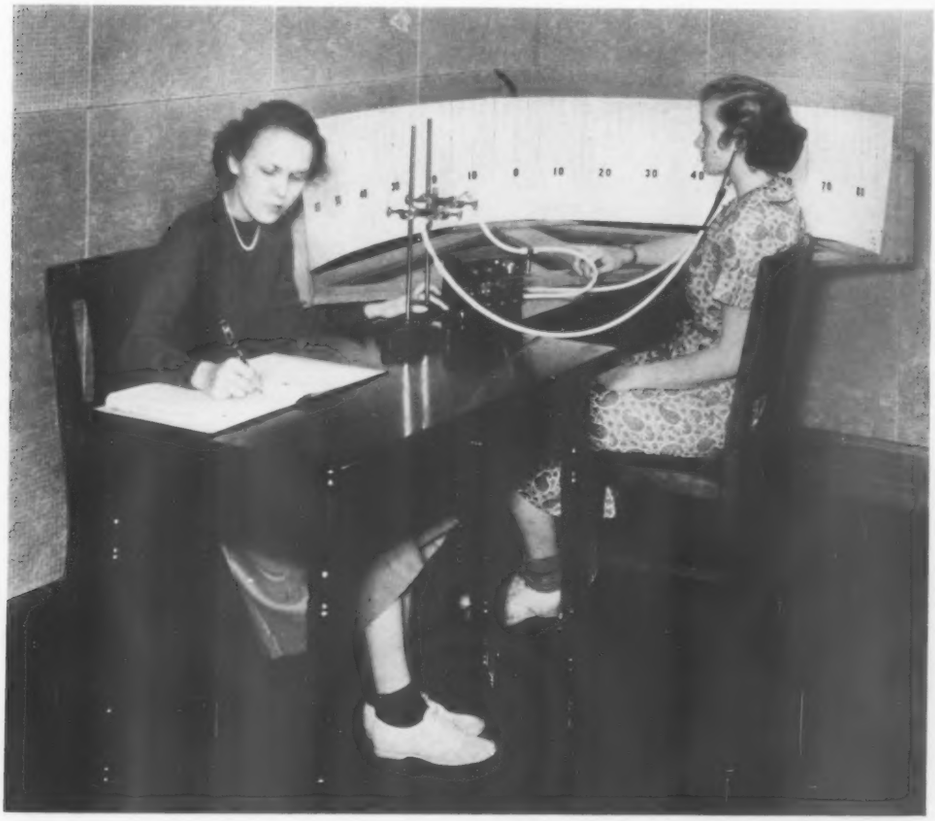
For careful auditory problem work, an insulated sound-proof room has been provided with a "floating floor" which makes it a completely isolated room within a room—thus eliminating sound from outside. Walls and ceiling are so treated that they do not reflect sound within. Students investigating tactual acuity have the benefit of an instrument called the cathode ray oscillograph which records nerve impulses during stimulation in the peripheral field a nerve supplies.

It is a policy of the Department to have the students work in couples, or in very small groups, on the experiments involving concentration and detailed observation. Fifteen small rooms are therefore provided for this laboratory work, besides a common laboratory for group demonstrations, and nine large laboratories for advanced work, five of them for special research. The Department has its own repair shop, where minor constructions may be made.

The library, planned as a memorial to Eleanor Acheson McCullough Gamble, late head of the Department, is used as a classroom by seminars where the students make constant reference to weighty volumes. The library is finished in early American style with pine paneling. Soft green leather chairs, as well as Windsor arm chairs, add to the charm of the room.

The Chemistry Department

The particular duties of a student chemist imposed upon the planners of the west wing of Pendleton Hall the special problems of ventilation and chemical-proof construction. The ventilating system of the Hall is especially elaborate here. Two great fans in the attic pump a large supply of warmed fresh air into the building and take out a larger volume through vents constructed of lead-coated copper. The more odorous experiments are confined to the upper floor, where they cause the least discomfort. Ventilating hoods are judiciously placed in the laboratories, their dampers and lights synchronized.



Psychology Students Conduct an Experiment in the Localization of Sound with an Audio-Oscillator in the Sound-Proof Room

The furniture and laboratory service materials are proofed against errors. The cabinets are of wood with synthetic acid- and alkali-resistant finish. The table tops are of alberene with ceramic sinks. The general supply pipes are copper, and the sink drains are of heavy lead connected to acid-resistant traps and lines.

Hot and cold water, distilled water, gas, vacuum, compressed air, high-pressure steam, and hydrogen sulfide systems, supply these necessities wherever they may be needed. Several circuits plugged into the switchboard in the physics laboratory, described above, provide any desired electrical current.

The rooms in greatest and most constant use, the departmental library, the three

lecture rooms (one of which seats 108 people), and the general chemistry laboratory, are on the main floor. On the ground floor below are the laboratories for quantitative work: physical chemistry, food and physiological chemistry, quantitative analysis and microanalysis. The laboratories for organic, qualitative and inorganic chemistry are located on the upper floor. On each floor at the center of the wing is a preparation and stock room for which there is elevator service from the general storage rooms on the ground floor.

The Chemistry Library

Each floor has additional rooms for private research and special laboratories. Notable among the latter is the spectroscope room on the ground floor—completely blackened and with two photographic dark-rooms at the far end. Here are set up various optical instruments, including a Hilger ultra-violet polarimeter and quartz spectrograph, Nutting and Pulfrich photometers, a constant deviation wave-length spectrometer, as well as several colorimeters and other pieces of apparatus.

Credit should go to Miss Louise S. McDowell, Chairman of the Department, from whose article "Physics at Wellesley," in *The American Physics Teacher*, May, 1936, several quotations have been used.

FOR ADDITIONAL REFERENCE

Previous editions of The American School and University* contained the following articles on laboratory construction and equipment:

IN THE 1935 EDITION

Recent Trends in Laboratory Construction, with Special Reference to Chemical Laboratories
By C. R. Hoover, Hall Laboratory of Chemistry, Wesleyan University; Chairman, National Research Council Committee on Laboratory Construction

The Science Building of Marlborough College, Wiltshire, England

Physics Classrooms and Laboratories in the Wichita High Schools
By J. W. E. Stogsdill, Instructor in Physics, Wichita High School East, Wichita, Kans.

IN THE 1936 EDITION

The New Chemistry Laboratories of the College of Arts and Sciences, Georgetown University
By Lawrence C. Gorman, Director of Chemistry

The New Engineering Building at the University of Virginia
By W. S. Rodman, Dean of Engineering

The Biological Science Building of the State College of Washington
By Stanley A. Smith, College Architect

See, also, the Classified Index in the rear of this volume for information concerning manufacturers of equipment or supplies. This list is necessarily abbreviated. To secure additional information concerning any product—whether listed in the Classified Index or not—use the reply postcards bound in this section.

* Copies available at $2.50 each.

ALBERENE STONE CORPORATION OF VIRGINIA

Quarriers and Fabricators of Alberene Soapstone
Virginia Alberene Stone and Virginia Black Serpentine

419 Fourth Avenue, New York, N. Y.

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Chicago, Ill.
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Rochester, N. Y.
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ALBERENE SOAPSTONE

Natural quarried stone of medium hardness, produced and fabricated for more than 40 years; used in increasing quantities for:

Table Tops and Backs
Reagent Shelving
Fume Hoods, Gutters
Sinks, Drainboards
Tanks and Tank Linings
Toilet Partitions
Shower Compartments
Interior and Exterior Trim
Door and Window Sills
Fireplace Linings, Hearths
Spandrels

VIRGINIA ALBERENE STONE

Selected stone of extreme hardness, reserved exclusively for Stair Treads, Landings, Platforms, and Flooring. Abrasive tests show the highest durability factor on the U. S. Bureau of Standards scale of any natural stone commercially used for these purposes. Its siliceous nature makes it non-slip wet or dry.

VIRGINIA BLACK SERPENTINE

This natural stone is becoming extremely popular. Its great resistance to weather action makes it desirable for exterior as well as interior work. When sand-blasted (as in spandrels) the fine tracery of the designs stands out against the polished black surface.

PHYSICAL AND CHEMICAL PROPERTIES

All Alberene stone is homogeneous and finely granular in all directions, blue-gray in color, dense and non-stratified, chemically resistant, impervious and non-staining. Alberene soapstone is easily machined—bored, slotted, grooved, tongued, turned—without splitting or spalling.

METHOD OF CONSTRUCTION

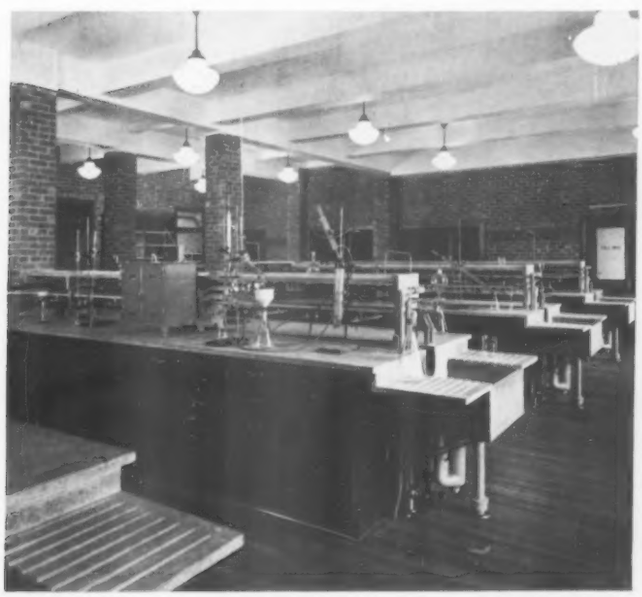
Alberene laboratory fixtures are practically one piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corrosive metal cemented in grooves, with abutting slab edges sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented—permanently gas and liquid tight.

SERVICE IN DESIGN AND INSTALLATION

Every laboratory of major importance equipped in the past 40 years has used Alberene soapstone wholly or in large part. Out of this experience the company offers an advisory service, freely available to school and university authorities and architects.

MANUFACTURING FACILITIES

Quarries and mills at Schuyler, Virginia, are the largest in the world devoted exclusively to the production and fabrication of special purpose stone.



Section of Chemical Engineering Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y. Installation by General Fireproofing Co., Youngstown, O.

Virginia Alberene Stone Stair Treads and Platforms in Woodrow Wilson High School, Washington, D. C. Nathan C. Wyeth, Municipal Architect

EDISON STORAGE BATTERY DIVISION

Thomas A. Edison, Incorporated

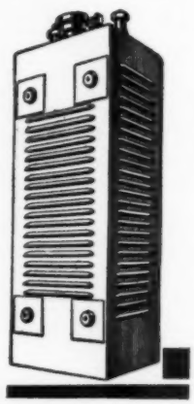
West Orange, New Jersey

EDISON STORAGE BATTERIES FOR SCHOOLS AND COLLEGES

For the School Plant

The vast improvements in plant made in educational institutions in recent years have resulted in the almost universal use of the following electrical services:

Telephone system
Fire drill and alarm system
Time clock system
Program bell and gong system
D.C. laboratory supply circuits
Emergency lighting system



Existing circuits in many schools are complex—because services were installed one after another as separate units. All these electrical circuits can be simplified and tied together, using the same source of power that supplies the building with light. In addition, many state legislatures have required that an entirely independent power source be provided to take over essential circuits automatically when the normal current supply fails.

An unfailing power source for this purpose is a dependable storage battery, kept continually charged by rectified central station power. The Edison nickel-iron-alkaline storage battery—because of its dependability, long life, economy and freedom from trouble—is the choice of those seeking the most reliable and economical power supply for school electrical uses.

For the School or College Laboratory

Storage batteries are used in school and college laboratories both as an aid in instruction concerning such batteries and as a source of direct current for students' experiments or for instructors' lecture demonstrations.

The Edison nickel-iron-alkaline storage battery as a source of d.c. for laboratory supply circuits affords a dependability no other type of battery can equal. Use of steel for all structural parts combined with an alkaline electrolute (a recognized preservative of steel), makes it practically indestructible and permits secure retention of all active materials within the plates.

An outstanding advantage of the Edison battery for school use is the fact that it cannot be injured by overcharge, overdischarge, charge in reverse or other so-called electrical accidents. Another advantage is the ability of the Edison battery to stand discharged during all vacation periods without need of attention, and without deterioration.

Still another feature is the convenience of using any number of cells in an assembly to vary the voltage as desired. This may result in unequal discharge and subsequently in overcharge of some cells when the assembly is recharged. Unlike other batteries, however, the Edison Nickel-Iron-Alkaline Battery is not injured by such treatment.

Built Like a Watch — Rugged as a Battleship

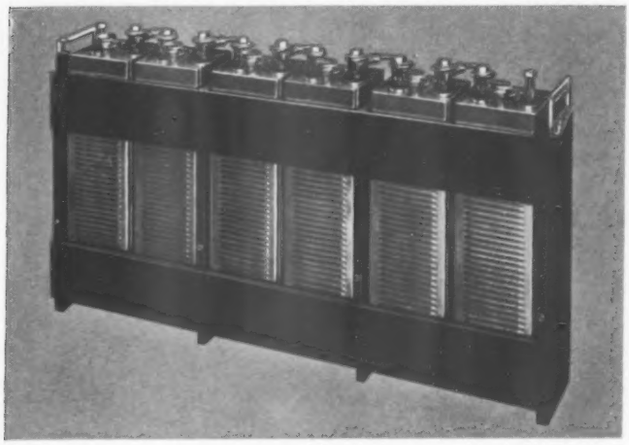
The Edison nickel-iron-alkaline storage battery is unlike other batteries in principle, design and construction.

Its principle of operation during a cycle of charge and discharge consists mainly of a transfer of oxygen back and forth between its positive and negative elements, whose general construction may be seen in the illustration of the cut-away cell (Page 461).

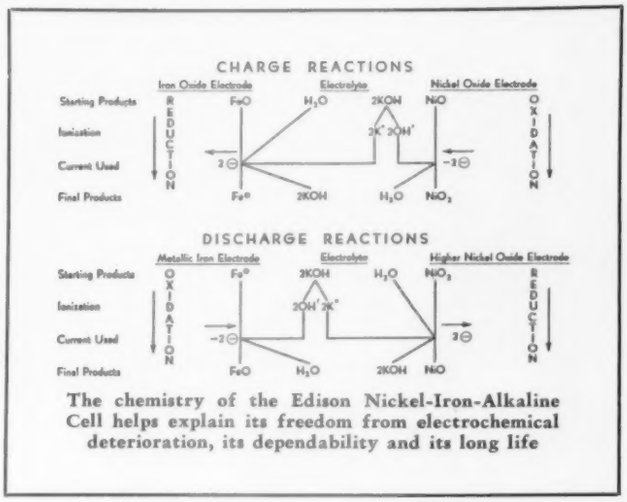
This electro-chemical action is unique in that it is completely reversible. With continued use, there is no loss in the quantity of active material in the plates. The electrolyte is an aqueous solution of potassium and lithium hydroxide and does not at any stage cause a disintegration or solution of the active materials.

Potassium hydroxide is a recognized preservative of steel, and to this fact is due the advantage of steel construction. As shown in the illustration, containers, grids, pole pieces—even the pockets and tubes enclosing the active materials—are of steel construction throughout. This results in great strength and durability combined with light weight.

The Edison storage battery gives a life up to twenty years in school services—often more (several times longer life than other batteries); therefore the cost per year of service is unusually low.



Typical Tray Assembly



The chemistry of the Edison Nickel-Iron-Alkaline Cell helps explain its freedom from electrochemical deterioration, its dependability and its long life

THE EDISON STORAGE BATTERY IN INDUSTRY

In the more important applications, such as mine locomotives and electric industrial trucks, more Edison Batteries are in daily use than all other kinds of batteries combined. In multiple unit car control, where the very lives of passengers are dependent upon the unfailing operation of a storage battery, Edison Batteries comprise more than nine out of every ten storage batteries in use. Other services include railway train car lighting and air conditioning, railway signaling, marine uses for radio lighting and operation of auxiliary equipment, time clock service and airway beacons. These widespread uses make instruction in the care, operation and construction of Edison batteries a matter of practical value to the student.

Railway Car Lighting and Air Conditioning

Safe Power for Mine Locomotives

Industrial Truck Propulsion

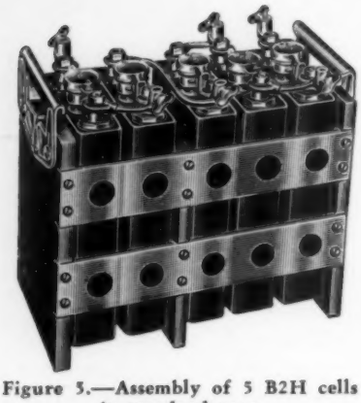


Figure 5.—Assembly of 5 B2H cells in standard tray

ADVANTAGE OF EDISON NICKEL-IRON-ALKALINE STORAGE BATTERY FOR D.C. LABORATORY SUPPLY CIRCUITS

Figure 6—All laboratory assemblies are supplied with tap-off connectors at no extra cost. This permits use of any number of cells as desired

Figure 7.—Assembly of 2 B1H cells in standard tray

Edison Nickel-Iron-Alkaline Storage Batteries are available in various capacities from 11.25 to 675 ampere hours for use in light, medium and heavy duty work. In the tabulation below are listed those sizes which are ordinarily employed to meet the various requirements of school and commercial laboratory work. Information regarding larger sizes will be furnished on request. E.M.F. averages 1.2 volts per cell for all sizes and types.

Edison Cell Type	List Price per Cell, F.O.B. Orange, N. J.	Ampere Hours	Amperes for 5 Hrs.	Length * 1 Cell Tray	Length* 5 Cell Tray	Width All Trays	Height All Trays	Approx. Weight per Cell
N2	$ 5.25	11.25	2.25	$2^{15}/_{16}$"	$10^{1}/_{16}$"	$3^{1}/_{2}$"	$8^{7}/_{16}$"	2.0 lbs.
B1	6.00	18.75	3.75	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$10^{13}/_{16}$"	5.3 lbs.
B1H** ..	6.50	18.75	3.75	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$12^{9}/_{16}$"	6.7 lbs.
B2	8.50	37.50	7.50	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$10^{13}/_{16}$"	6.0 lbs.
B2H** ..	9.00	37.50	7.50	$3^{1}/_{16}$"	$10^{23}/_{32}$"	$6^{1}/_{8}$"	$12^{9}/_{16}$"	7.2 lbs.
B4	11.75	75.00	15.00	$4^{1}/_{4}$"	$16^{21}/_{32}$"	$6^{1}/_{8}$"	$10^{13}/_{16}$"	9.5 lbs.
B4H** ...	12.25	75.00	15.00	$4^{1}/_{4}$"	$16^{21}/_{32}$"	$6^{1}/_{8}$"	$12^{9}/_{16}$"	10.9 lbs.
B6	16.00	112.50	22.50	$5^{3}/_{8}$"	$22^{9}/_{32}$"	$6^{1}/_{8}$"	$11^{1}/_{32}$"	13.0 lbs.
B6H** ..	16.50	112.50	22.50	$5^{3}/_{8}$"	$22^{9}/_{32}$"	$6^{1}/_{8}$"	$12^{27}/_{32}$"	15.2 lbs.
A4	20.00	150.00	30.00	$4^{17}/_{32}$"	$17^{5}/_{32}$"	$6^{1}/_{8}$"	$15^{29}/_{32}$"	16.5 lbs.
A4H	20.50	150.00	30.00	$4^{17}/_{32}$"	$17^{5}/_{32}$"	$6^{1}/_{8}$"	$18^{19}/_{32}$"	19.3 lbs.
A6	27.50	225.00	45.00	$5^{23}/_{32}$"	$23^{3}/_{32}$"	$6^{1}/_{8}$"	$15^{31}/_{32}$"	22.4 lbs.
A6H	28.00	225.00	45.00	$5^{23}/_{32}$"	$23^{3}/_{32}$"	$6^{1}/_{8}$"	$19^{3}/_{32}$"	25.5 lbs.

* Available in any number of cells per tray up to 16 cells (30 1/8" long) for N2 type; up to 12 cells (24 3/8" long) for B1, B1H, and B2H types; up to 12 cells (39" long) for B4 and B4H types; up to 10 cells (44 1/8" long) for B6 and B6H types; up to 12 cells (39 3/8" long) for A4 and A4H types; and up to 10 cells (45 3/16" long) for A6 and A6H types.

** The letter "H" denotes high type cells; these cells have the same characteristics as standard cells but are built higher so as to hold more electrolyte and are used in installations where extremely infrequent flushing periods are desirable.

OUTSTANDING ADVANTAGES OF THE EDISON STORAGE BATTERY

1. Its life is so long that the annual depreciation figure is lower than that for any other type of storage battery.
2. Its nickeled steel container is unbreakable.
3. The Edison battery, unlike all other types, is easy to lay up. Merely discharge it to zero voltage and short circuit. It may be left standing idle in this condition indefinitely without injury.
4. It may be short-circuited without injury.
5. Unlike all other batteries, an accidental charge in the reverse direction will not injure an Edison battery.
6. It is entirely free from ordinary storage battery diseases.
7. Freedom from corrosive acid fumes permits its use in close proximity to delicate apparatus.
8. It is not damaged by freezing.
9. Its electrolyte is a preservative of steel.
10. It increases in capacity during the first several years of service.
11. It requires no internal cleaning; the active materials being held securely in perforated nickeled steel tubes and pockets.
12. Its cells are hermetically sealed except for the single filler opening, indicating conclusively that no plate renewals or other repairs are needed or expected.
13. Its tray assembly and cell connections are extremely simple.
14. It requires no spare parts.
15. It does not require weekly equalizing charges.
16. It requires NO renewals of separators throughout its long life.
17. It is light in weight.

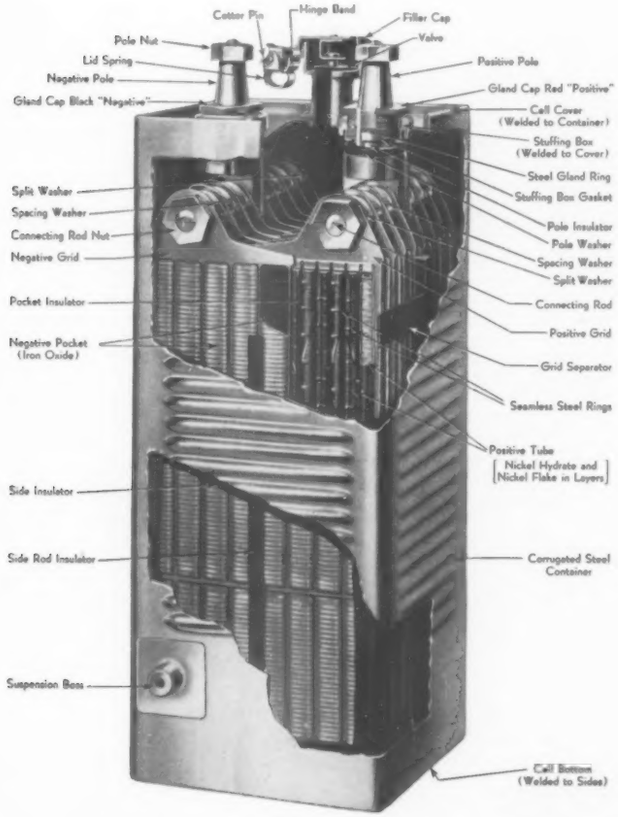
THE EDISON NICKEL-IRON-ALKALINE STORAGE BATTERY GIVES 2 TO 5 TIMES LONGER LIFE THAN OTHER BATTERIES

Edison Storage Batteries give a life of seven years to sixteen years, often more, depending upon the type of service in which they are used.

Some of the Edison Batteries installed over twenty-five years ago are still in use, performing satisfactorily with records of negligible maintenance costs.

The statement of the late Charles P. Steinmetz, quoted below, sums up the fundamental reasons which account for the Edison Battery's long life:

> "The characteristic feature of the Edison Battery, which appears to me as the main advantage, is the complete reversibility of the chemical reactions which occur in it.
>
> "With the materials—iron, nickel, and their oxides, in caustic potash as electrolyte—no chemical process can occur which is not electrolytically reversible. From that then would follow that there could theoretically be no deterioration of the battery, that is, no decrease of capacity from use or abuse.
>
> "It cannot be seen how an irreversible process could occur in the Edison Battery. . . . The battery does not age, has no definite life, but its life is limited, theoretically, only by mechanical destruction."



100 Cell Edison Battery at Rutgers University Science Building installed seven years ago

BOOKLETS AVAILABLE

The Edison Storage Battery Division, West Orange, New Jersey, will gladly supply further information to any interested school or college executives. 30-page pamphlet, "Edison and His Storage Battery," by W. H. Meadowcroft, which includes chronology of notable events and achievements in the life of Thomas Alva Edison, is also available upon request.

RAWSON ELECTRICAL INSTRUMENT CO.

INCORPORATED

Cambridge, Mass.

BRANCHES

New York City and Chicago

Specialists in High Sensitivity Meters

Special Apparatus Built to Order

29 RANGES—SIZE 12″ x 8″ x 6″

Still leading in the field of portable high sensitivity electrical measuring instruments. Recent developments have extended the possible range of regular spring controlled portable meters still further. These improvements are in a large measure due to the unique patented method of pivoting, both top and bottom pivot pointing in the same direction. Both pivots are only in contact with their jewel bearings at their extreme tips thereby ensuring a greater degree of constancy of calibration and also providing the very desirable feature of adaptability for mechanical clamping of movement during transit. Ordinary two pivot movements with pivots pointing in opposite directions must of necessity have one of the pivots wobbling around due to the impossibility of tightening sufficiently within the conically shaped jewel bearing with its accompanying change of movement position within the magnetic gap unless in exactly the same position as when calibrated, and also makes impossible the clamping feature.

The Rawson meter is the only meter which has this valuable feature. So-called electrical clamping does not accomplish the same purpose, it only avoids slamming of pointer in a lateral direction on account of excessive damping due to short circuiting of moving coil. The pivots are still liable to damage due to excessive jarring in transit.

Various meters are illustrated in the following pages.

TYPE 501

MICROAMMETERS, MILLIAMMETERS, MILLIVOLTMETERS, and VOLTMETERS

Single Ranges—From 2 microamperes to 1 ampere, full scale. From 1 millivolt to 1000 volts, full scale.

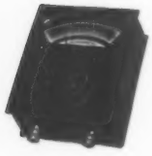
Multiranges—From 4 microamperes to 1 ampere, full scale. From 2 millivolts to 1000 volts, full scale.

These meters are strictly portable and can be relied upon to hold their accuracy.

TYPE 505

SWITCHBOARD PATTERN METERS

These cannot be supplied with internally mounted thermocouples. Standard pattern as illustrated, meter fitted with detachable swivel back-plate. Often supplied with angle lugs on sides so that only the front curved portion of meter projects through a rectangular hole in switchboard panel. Same ranges and price as Type 501.



TYPE 507

SMALL METERS

These meters are especially adapted for use in test sets for production testing, etc. Can be supplied with flange under edge of cover for panel mounting. They cover the same ranges as the Type 501 but are about 30% less in price. They are especially suited for Portable Galvanometer work. The case is too small to properly accommodate the internal mounting of thermocouples in vacuo.

TYPE 501

MULTIMETERS FOR D.C.

Rawson Multimeters were the first in the American market to cover anywhere near the number of ranges in both Current and Potential. There are five current ranges covering readings from 1 microampere to 1 ampere and nine potential ranges reading from 20 microvolts to 1000 volts, the volt ranges having a resistance of 1000 ohms per volt. External shunts can be supplied to extend current ranges to 100 Amperes. Ranges controlled by a well designed instrument switch.

TYPE 503

SEMI-SUSPENDED MICROAMMETERS, MILLIAMMETERS and MILLIVOLTMETERS

For Ultra-sensitivity in strictly portable meters the Rawson Semi-suspended meter cannot be beaten. Although a suspension type movement is used, no fussy leveling is required, as at the center of gravity a guide pivot is used. Friction is eliminated by careful adjustment of suspension support which carries the weight of the movement. D.C. Currents as low as 5×10^{-9} Amp. or .005 microampere, can be measured. D.C. Potentials down to 1 microvolt, while voltmeters having a resistance of 2 Megohms per volt can be supplied. Fitted with internal thermocouple, A.C. Currents of any frequency can be measured down to 100 microamps, but the meter is slow in action due to overdamping. A.C. Voltmeters with 2000 ohms per volt are furnished, also multirange meters for both D.C. and A.C. or D.C.

TYPE 5053

Similar to Type 505 but with semisuspension element. D.C. ranges full scale from 0.75 microamperes and 0.24 millivolts. Same price as Type 503. Calibrated as A.C. meters only with externally mounted thermocouples.

TYPE 5073

Similar to Type 507 but with suspension element. Supplied in same D.C. ranges as Type 503. Especially suitable for Galvanometer work and for High Insulation values. Price about 30% less than Type 503.

TYPE 508

ELECTROSTATIC VOLTMETERS

No power consumption on D.C. and very little on A.C. Full scale ranges from 120 to 3000 volts and up to 40,000 volts by the use of condenser multipliers. Measures true R.M.S. values. Special high ranges built on request. Capacity is kept to a minimum and the insulation is exceptionally good, thereby reducing losses to negligible values on commercial frequencies.

TYPE 502

THERMAL MILLIAMMETERS and VOLTMETERS

There has not yet been found a good substitute for the Thermal Milliammeters and Voltmeters. Their noninductive anticapacity features render them independent of frequency changes to a very large extent. Regular multirange meters are good on frequencies up to from zero to 5000 cycles, while single ranges are good up into the Radio frequencies. They measure true R.M.S. values. The necessary Rawson Thermocouple in vacuo is mounted internally and scale calibration made in terms of current through heater. One very useful feature is that they can be calibrated against regular D.C. Standards. On single ranges they cover full scale from 1 milliamp to 1 ampere, and on multiranges from full scale for 2 milliamps to 5 amps, and Voltages on single ranges from .25 volt to 1500 volts and multiranges from .3 volt to 1500 volts.

TYPE 502

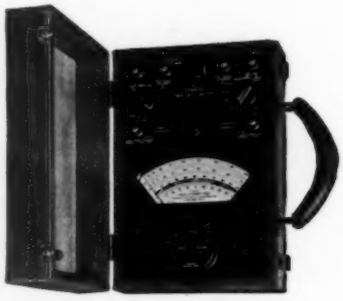
THERMAL MULTIMETERS

These make good companion meters to the D.C. Multimeters, covering six ranges in current from 10 milliamperes full scale to 3 amperes, and eight potential ranges from .3 volt to 1000 volts. A special Central Station Thermal Multimeter covers from 15 milliamperes full scale to 5 amperes and .5 volt to 1500 volts.

TYPE 5012

TWIN MULTIMETERS

The Rawson Twin Multimeter combines the Type 501 D.C. Multimeter and the Type 502 Thermal Multimeter into one compact meter covering twenty-nine different ranges. This occupies less space than any other near equivalent meter.



TYPE 515

THERMOCOUPLES IN VACUO

Rawson Thermocouples in vacuo are known for their sturdiness and dependability. They are the best known means of measuring true R.M.S. values on any frequency. The standard type are good for all frequencies including Radio frequencies. For very short wave circuits a special is supplied with heater and leads in straight line, with junction taken off at right angles to heater thereby reducing inductance and capacity to a minimum. Supplied in vacuo for normal rated currents of from 1.5 milliamp to 1 ampere, and in air from .5 amp to 10 amp. Higher ranges supplied to special order. Sold either unmounted or mounted in special bakelite cases, and also fitted into UX bases if desired.

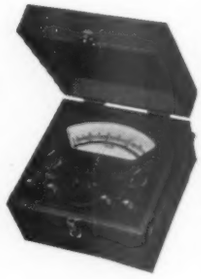
TYPE 504

FLUXMETERS

Rawson Fluxmeters are without doubt the sturdiest and best meters obtainable having patented features contained in no others. They need no accurate leveling, can be clamped for transit, and pointer is snappily returned to zero electrically. The standard meter carries a scale 50-0-50 divisions, calibrated an even 10,000 Lines or Maxwells per division using a one turn search coil. A 1000 turn coil gives a reading of 10 Maxwells per division. A 30-0-30 division scale can be supplied if requested. Special search coils for production testing of magnets supplied to suit magnet specifications, at cost.

TYPE 520

WATTMETERS



Rawson Wattmeters are the highest sensitivity portable power measuring instruments on the market and are suitable for use on very low power factor circuits. Maximum Current, Potential and Power Factor expected in circuits should be stated when making inquiries concerning these remarkable meters.

TYPE 520

DYNAMOMETER MILLIAMMETERS and VOLTMETERS

Current ranges can be supplied from full scale of 2 milliamps up to 1 ampere. Ammeters up to 10 amperes. Volt ranges full scale .5 volt up to 1000 volts.

TYPE 701

OHMMETERS

There are many useful Ohmmeters on the market, but not so many where the necessary current to work them is harmless to the apparatus under test. Especially is this noticeable on low resistance ranges. The Rawson Ohmmeter can be supplied with practically evenly divided scales down to 0-20 Ohms, with a maximum possible current of 1.1 milliamp in circuit, while on higher ranges the current can be made much less. These meters are fitted with an adjustable magnetic shunt which compensates for plus or minus 10% of normal rated battery voltage. Dry batteries are fitted internally which are automatically switched to "off" position when not in actual use. Provision is made for the use of external batteries if desired. Ohmmeters for use with externally applied potential can be supplied to measure up into the thousands of megohms. Inquiries concerning specific ranges with stated voltages invited.

TYPE 602

RAWSON-GREIBACH A.C. and D.C. METERS

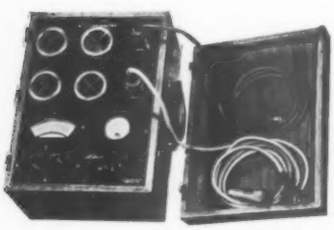
These are electronic meters manufactured under the Greibach patent, having several unique features. Some of these are; much lower power consumption than thermocouple meters, has its own filament current supply for the two tubes used, no plate batteries, no amplification of any kind, reads true R.M.S. values, can be checked on D.C., covers ranges in volts from .3 to 100 volts with resistances of 15,000, 25,000 and 50,000 ohms per volt, and current ranges from 30 microamps to 1 ampere with resistances much below that of thermocouple meters of equal range.

TYPE 112

LUSH CABLE TESTER

This meter was primarily developed to locate high resistance faults on cables without the necessity of breaking them down by use of a much higher voltage than the rating of the cable. The old established Fall of Potential method is used but the objectionable effects of ground and stray currents are eliminated by the use of a double commutator, both on the same shaft and revolved by hand. This results in a flat topped alternating current derived from an ordinary 6 volt storage battery being sent through one commutator and line, and potential therefrom being picked up and applied to an extremely high sensitivity D.C. voltmeter through the second commutator. Through a simple switching device the current flowing and the potential across line can be measured to the exact points of connections to cables resulting in the best possible means of measuring low resistances, also means to measure potential drop from one end of a good return line to fault and from fault to other end, for the purpose of locating grounds or shorts. Another position of switch puts line in series with supply voltage and reading taken through insulation. The last switch position allows a reading to be taken through capacity of cable to an open in line.

M. I. T. KNOCKMETER



In connection with research work in the Aeronautical Department of the Massachusetts Institute of Technology, Prof. E. S. Taylor, Dr. C. S. Draper and others, together with the cooperation of the Rawson Electrical Instrument Company a meter was developed for use in research and blending of gasolines against Octane Heptane standards. A suitable engine unit containing a heavy diaphragm, pick-up coil and electromagnetic circuit is screwed into the test engine cylinder head and the resulting characteristic knock of the rapidly expanding gases is transmitted through diaphragm to pick-up coil, the tiny current generated is suitably amplified and led through a rectifier to a specially constructed slow acting meter. The slow action effectively damps out the somewhat erratic action of the individual explosions in the cylinder. The meter is manufactured under patents applied for by the M. I. T.

RAWSON VACUUM GAUGE

This meter has several unique features. It is A.C. operated, contains but a single meter of high sensitivity. The use of this meter allows the heater of the thermocouple to run at a very low temperature thereby eliminating problems caused by oxidation at the usual higher operating temperatures. The gauge is introduced to give reliable vacuum readings in the range 5000 to 0.5 microns, reading continuously. The thermocouples are completely interchangeable and when used with a carbon dioxide trap on the system are really secondary standard vacuum gauges. The instrument may be obtained calibrated for use in systems containing gases other than air, if so desired. A simpler meter with uncalibrated thermocouple for use as a vacuum leakage indicator can also be supplied at a lower cost.

RAWSON ASTATIC GALVANOMETER

For Geodetic survey work a portable Astatic Galvanometer has been developed by the Rawson Electrical Instrument Company in cooperation with the Department of Terrestrial Magnetism. Details of this will be available when released by the above Department.

KASSON TIMER

This useful little meter is covered by the Kasson patent and was developed for the purpose of timing the adjustment of relays in Central Stations. A 60 cycle synchronous motor drives a revolving solenoid at the rate of one revolution in two seconds. A magnetic clutch working in conjunction with the solenoid carries the knife edge pointer over the scale which is divided into 200 divisions and numbered every 0.1 second. Each division represents a time interval of .01 second.

McCOLLUM EARTH CURRENT METER

A true measure of hazard due to electrolysis in buried pipes and structures is a questionable proposition unless a good understanding of the problem and the proper apparatus is available. Some years ago this was studied to great length by members of the Bureau of Standards and in particular by McCollum, Logan and Shepard. The Rawson Electrical Instrument Co. cooperated and the outcome is the McCollum

Earth Current Meter. The whole problem together with application of the meter is discussed in Bureau of Standards Bulletins No. 351 and 355.

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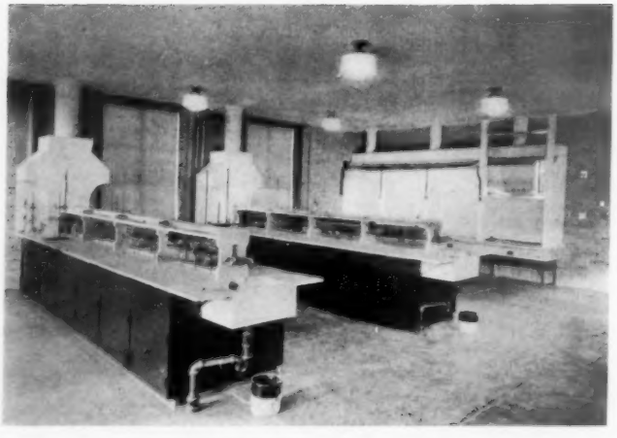
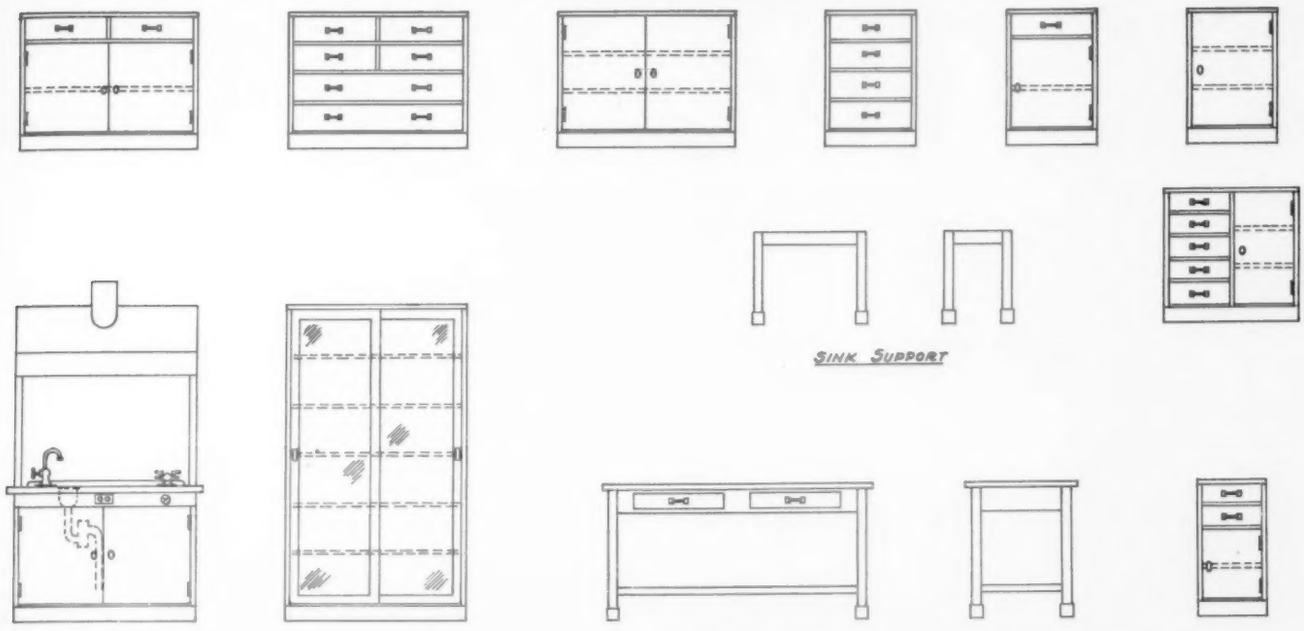


Organic Chemistry, Ursinus College



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CORROSIRON

DRAIN PIPE AND FITTINGS

CORROSIRON is a high silicon iron alloy having a silicon content in excess of 14.25% unless otherwise specified. It is not a mixture or a formula, but a process developed under both metallurgical and foundry supervision including alloys prepared in the electric furnace.

It is a homogeneous alloy requiring neither treatment nor surface coating to obtain its excellent resistivity to corrosion and wear. CORROSIRON manufactured exclusively by the Pacific Foundry Company, Ltd.

From a corrosion standpoint, CORROSIRON gives exceedingly long life in contact with sulphuric, nitric and other acids and chemicals in commercial use and is used extensively for acid drain lines in Hospitals, Colleges, Universities, High Schools, Laboratories, etc.

- **CORROSIRON** drain pipe and fittings dimensions are in accordance with those of standard extra heavy cast iron drain pipe; is readily installed and no unusual precautions need be taken excepting that lines should be secured and anchored closer than cast iron.
- **CORROSIRON** pipe is readily cut on the job using either special spring mounted pipe cutting tools or a cold chisel. Two or three turns round the pipe following a marked line with a cold chisel and light hammer blows will produce a clean break along the marked line.

  Joints are made as usual, using molten lead or lead wool and it is advisable to protect this lead from corrosion by packing the bottom of the bell with asbestos rope or Asbestos Wicking, which cannot be excelled for acid line service. Oakum or hemp are not satisfactory for acid lines.
- **CORROSIRON** has been manufactured and in satisfactory service for over 20 years proving its acceptability for acid and sanitary drains; has the approval of sanitary engineers of all the Federal, State and City authorities and conforms to building codes and requirements.

We suggest the following form as a specification for use by architects and engineers:

SPECIFICATIONS

All acid proof drain pipe and fittings shall be ferro-silicon—CORROSIRON—or equal to comply with the following analysis:

All acid waste and acid vent piping shall be of approved high silicon cast iron bell and spigot type and shall contain:

"Not less than 14.25% and not more than 15% silicon.
Manganese below .50%.
Total carbon content below 1.12% and above .50%.
Sulphur below .05%.

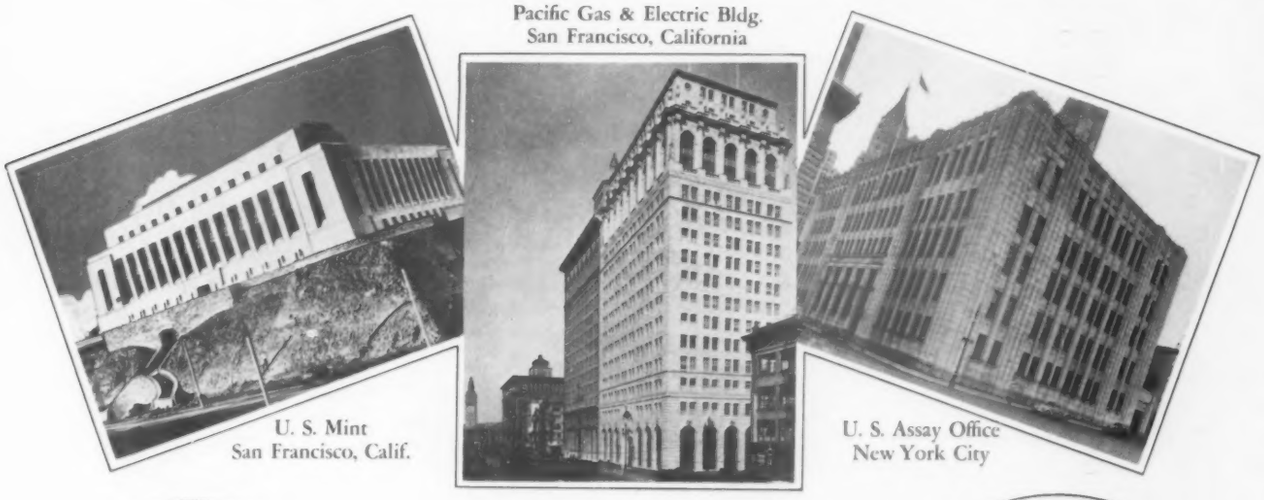
"High silicon cast iron pipe and fittings for acid waste and acid vent pipe shall be of the thickness, etc., corresponding to extra heavy soil pipe and fittings unless otherwise approved."

CORROSIRON
MADE IN U.S.A.
HIGH SILICON ACID RESISTING IRON

CORROSIRON

MADE IN U.S.A.

HIGH SILICON ACID RESISTING IRON



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U. S. Mint
San Francisco, Calif.

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These Schools, Colleges, Hospitals, Public and Private Buildings, *and many others, everywhere* specified acid-proof CORROSIRON drain pipe and fittings exclusively... because of its superior resistance to corrosion and wear.

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Technical High School
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GIANNINI HALL
UNIVERSITY OF CALIFORNIA
BERKELEY, CALIFORNIA

Oregon State College
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Original and Sole Manufacturers of "Barnstead Stills"

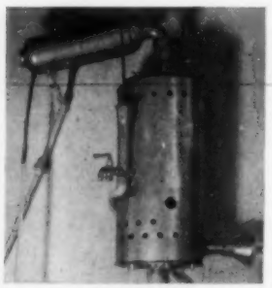
BARNSTEAD WATER STILLS

For more than sixty years Barnstead Water Stills have proved their ability to meet every laboratory requirement. They provide a distillate of unsurpassable purity. They are easy and economical to operate. And they are compact and attractive in appearance.

Such Barnstead features as preheating and venting that eliminate all volatile impurities; baffles that prevent evaporator impurities from contaminating the distillate; and low cost counter-current operation have made these stills the universal choice of not only leading colleges but of the foremost hospitals and industrial plants as well. All Barnstead stills are made to go on the job and stay on the job. Construction is of copper and brass throughout. Linings are of pure block tin.

Furthermore there is a Barnstead still to meet every individual need. Sizes range from ½ to 5000 gallons per day. Mountings are for walls, tables, stands or concealment behind the wall. And operation is by gas, steam or electricity. Continuous and automatic operation with safety shut-offs can be furnished.

FOR ALL ROUTINE WORK



Barnstead Single water stills provide a distillate that will meet the demands of all routine laboratory work. It is chemically and bacteriologically pure and has shown under actual tests to have a conductivity as low as $1.5 - 2.0 \times 10^{-6}$ reciprocal ohms.

Barnstead single stills are simple to operate and easy to clean. They require practically no attention. They come in all sizes. Are compact and finished in keeping with the finest laboratory appointments.

FOR SPECIAL AND DELICATE WORK

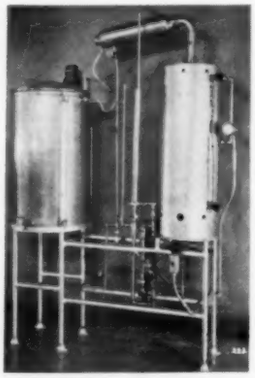
Many laboratories, particularly in medical schools, need a special distilled water for delicate research and experiments. For this grade of distillate a Barnstead double or triple still is recommended. These stills eliminate the human factor entirely. They supply a distillate that's free of all pyrogenic impurities including bacterial toxins. Special Spanish prison type baffles eliminate all possibilities of entrained impurities contaminating the distillate. Operation is completely automatic.

TO OVERCOME HARD WATER CONDITIONS

Distillation problems arising from excessively hard water can be easily overcome with Barnstead Hard Water Stills. Contamination of the distillate by foaming and or priming is completely eliminated by an extra high condenser casing. Concentration of dissolved or suspended impurities in the boiling water is kept down by a Barnstead Constant Bleeder Device, which bleeds boiling water from the evaporator at a constant rate. This greatly reduces the rate of scale formation and simplifies cleaning.

TO INSURE AN EVER-READY SUPPLY

With a Barnstead Full-Automatic-Controlled System you have ready at all times a chemically pure supply of distilled water sufficient to meet the most varied needs. These systems require absolutely no attention and are especially desirable where large quantities of distilled water are constantly needed.



They are equipped with a Storage Tank that automatically keeps filled between predetermined high and low levels at all times with distilled water. When the distilled water reaches the low mark in the tank the still automatically starts. When the tank becomes full the heat shuts off and the evaporator is automatically flushed. In electrically heated systems, heating units are further protected by automatic cut-offs that prevent damage in case of water supply failure. In institutions where a number of departments use distilled water, the distillate can be piped by gravity from a central plant, thus obviating the need of a separate still for each department. All pipes are lined with pure block tin. Barnstead full automatic systems are operated by gas, steam or electricity. They come in all sizes. Storage tanks, all sizes, come in copper and brass or wood. Lining is of pure block tin. Tanks may be equipped with sterilizers.

OTHER BARNSTEAD EQUIPMENT

Barnstead manufactures a full line of laboratory distilling equipment including conductivity stills, alcohol concentrators, solvent recovery stills, electric steam generators and Soxhlet extractors. Send for bulletins.

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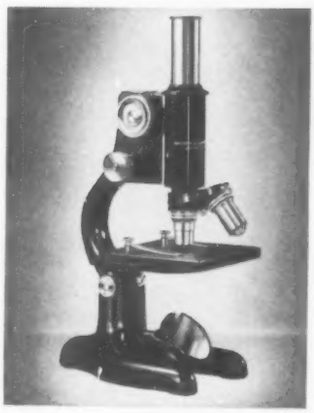
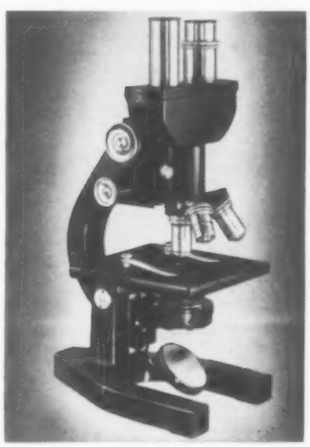
FB MICROSCOPE



Microscope FB is especially designed and built for elementary science work and its price, based on quantity production, is in line with the most restricted budget. It is ruggedly built to stand many years of hard class room usage. Its optics are of the same precision type that characterize the more expensive research type of instrument. Features include standard size, coarse and fine adjustments, double revolving nose piece, standard objectives and eyepieces, disc diaphragm, solid Bakelite stage, concave mirror, etc. Velvety black, wear resisting finish—Chromium plated parts.

Microscope F is similar to the instrument above but fine adjustment has been eliminated in the interests of economy. Magnifications range from 20 to 310 diameters.

HSE-8 MICROSCOPE



This splendidly designed and sturdily built microscope is especially adapted for advanced work in universities. Has vertical binocular body tube (interchangeable with monocular tube for photomicrography). The large stage (115 mm x 130 mm) is plain although any type of stage can readily be attached. The Abbe type condenser, 1.20 N.A., is in rack and pinion sub-stage. Huygenian type eyepieces and Achromatic objectives are of the finest grade optically. Oil immersion objective included. Other eyepieces and objectives for various purposes are available. Inclined binocular body tube is recommended for greatest comfort in extended observations.

K TYPE BINOCULAR MICROSCOPE

The great popularity of the K Type Binocular Microscope has prompted us to offer the Model "K," for schools and universities. Its range of magnifications of from 7X to 150X especially suit it for biological, bacteriological and paleontological work. An interesting feature of this series is the new dustproof Shuttle nosepiece, specially made for this series. This microscope gives stereoscopic, three dimensional effect. Image is upright and unreversed. Exceptionally wide field.

MICROSCOPE TABLE LAMP

This Table Lamp can be used to illuminate several microscopes at once. It is invaluable in class room work where groups of students are making observations at the same time.

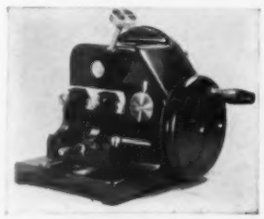
Equipped with daylight blue globe, this lamp represents the finest source of artificial daylight for the microscope, approximating noon sun light.

UNIVERSAL MICROSCOPE LAMP

The B & L Universal Microscope Lamp is an economical, convenient illuminator that has universal application in any school laboratory where microscopes are used.

B & L MICROTOMES

The B & L line of Microtomes is most complete. The Minot Automatic Rotary Microtome illustrated is ideal for rapid serial sectioning, cutting section with accuracy down to 1 micron in thickness. Feeding mechanism operates automatically. Dustproof operating mechanism. Catalog D-21 describes the complete line, including the new Precision Automatic Microtome—motor driven.



B & L SPECTROGRAPHS

The complete B & L line of Spectrographic Equipment covers every need. Models range from the Bunsen Spectroscope for elementary class room work to the large Littrow Spectrograph for examining complex alloys. Each is designed and built with the utmost care and due to our great experience in this field represents all of the best features necessary for both teaching and laboratory research. Catalogs D-221 and D-20 give complete details.

QR MAGNIFIER

This is an adjustable tripod type magnifier which is placed directly over the specimen. Has double lens, magnifying 7.5X. Useful for the school laboratory in examining biological or botanical specimens or any small objects.

SEND FOR CATALOGS

For complete information on Laboratory Microscopes send for Catalog D-185. For information on B & L Balopticons see page 306 this catalog. Remember the instruments listed on these pages are but a small part of the B & L Line. If you have need for information on any optical products whatsoever, Bausch & Lomb will gladly be of service to you.

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Asbestos Filter Mats of all porosities, shapes and sizes are available for all makes of filtering machines.

Our iron-free **Asbestos, Cotton, and Diatomaceous Silica Filter Aids** for pressure filters are of the highest quality.

We supply both Cotton and Asbestos **Filter Masse.**

Some of the liquids filtered with E&D products are mineral and vegetable oils, varnishes, paints, all alcoholic and non-alcoholic beverages, sugar, perfumes, extracts, drugs, chemicals, soaps, glue, ink, fruit juices.

Filter Paper Clippings free from dust and grease are recommended to manufacturers of pharmaceutical, biological products in filtering machines, etc.

E&D Bibulous Paper with good absorbent quality recommended for drying bacteriological slides, etc., supplied in sheets any size or books of fifty sheets 4″ x 6″ with advertising matter on covers.

E&D Lining Paper, white or granite color, prevents glassware breakage and absorbs spilled liquids when placed in drawers and on shelves.

A fully equipped laboratory for making filtration tests is maintained for benefit of our customers.

If your dealer does not carry E&D products write The Eaton-Dikeman Company direct for samples and recommendations.

PHYSICAL CHARACTERISTICS OF MOST POPULAR LABORATORY GRADES

Grade	Color	Surface	Texture	Rapidity cc. per Min.
612	White	Embossed	Med. Close	20-35
613	White	Smooth	Very Close	15-35
615	White	Creped	Fairly Open	75-150
617	White	Creped	Open	150-250
619	Gray	Creped	Fairly Open	75-150
620	Gray	Embossed	Fairly Close	45-70
629	White	Smooth	Med. Close	50-75

Note: Rapidity is number of cubic centimeters of distilled water filtered per minute in a 4″ 60° funnel.

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World's Largest Manufacturers of Storage Batteries for Every Purpose

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INSTANTANEOUS
EMERGENCY LIGHT
AND POWER
See Page 127

Exide Batteries, the product of The Electric Storage Battery Company, are extensively used in the laboratories of the nation's foremost scientists, industrial research engineers, schools and colleges. Their performance records are the best testimony that can be offered as to their merit for laboratory services. The foremost characteristics of Exide Batteries are absolute dependability and sustained high voltage until end of discharge.

Flexibility

The operation of an Exide Battery is flexible. Cell connections to the battery can be arranged so as to give any desired voltage, with a wide range in discharge rates available at that voltage. By assigning a group of cells of the battery to a definite experiment, a constant voltage is assured which is free from disturbance or interference by any outside influence.

Improved Design Simplifies Maintenance

Exide Batteries of the sealed glass jar type have been carefully designed and are carefully constructed for laboratory service. A deep sediment space is provided at the bottom of each cell. Posts and connections are adequate for extremely high discharge rates and inter-cell connectors are of copper heavily coated with lead.

An Exide Chloride Laboratory Battery Cell Cut-away to Show Unique and Sturdy Construction, Sealed Glass Jar Assembly

The structural details of Exide Batteries assembled in sealed glass jars have been so refined as to eliminate all maintenance attention other than recharging and an occasional addition of water, which, with automatic cell fillers, becomes a simple task.

Long Life

Exide Batteries are not only noted for their long life in laboratory service, but also in *all* types of industrial stationary service. *There are Exide-Chloride Batteries in laboratory and industrial installations which have been in constant use for 20 years and longer.*

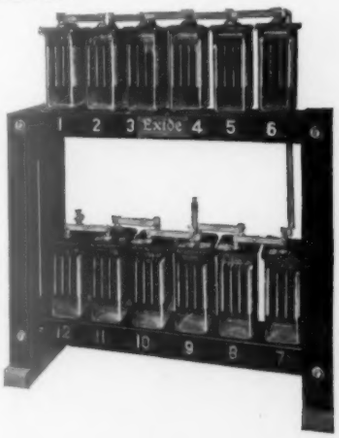
For Any Budget

Regardless of how limited your budget appropriation, an Exide Battery can be selected to meet your requirements. They are available in a wide range of sizes and capacities, and can be installed so that cells may be added subsequently to obtain greater capacity.

Nation-wide Organization

We are prepared and equipped to help you with any laboratory battery problem which may present itself. The wide experience of Exide engineers and the services of our nation-wide Exide organization are at your disposal. Write to the nearest Exide office shown above for further information.

The Exide Chloride Battery in The Research Laboratory of Physics, Harvard University. It is Used for General Service Where Various Potentials from 2 Volts to 240 Volts Are Required



A Typical 12 Cell Exide Chloride Battery Widely Used in School and College Laboratory Work

THE AMERICAN SCHOOL AND UNIVERSITY

GENERAL CERAMICS COMPANY

Manufacturers of Acid-Proof Chemical Stoneware

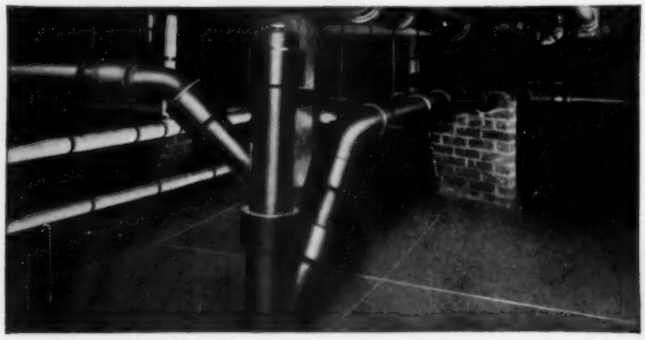
30 Rockefeller Plaza, New York, N. Y.

Buffalo Chicago Los Angeles San Francisco Montreal

ACID-PROOF CHEMICAL STONEWARE LABORATORY EQUIPMENT

The Chemical Stoneware Division of the General Ceramics Company makes a complete line of acid-proof chemical stoneware equipment for chemistry and physics laboratories in educational and research institutions, for general industrial chemical purposes, and for hospitals, electro-plating plants, newspapers, photo-engraving shops, and other establishments where corrosive fluids are used.

General Ceramics Chemical Stoneware Laboratory Equipment is widely used in educational institutions throughout



General Ceramics Chemical Stoneware Piping in the Sterling Chemistry Laboratory at Yale University

the country. In fact, a list of the colleges and universities with chemistry laboratories equipped with General Ceramics Chemical Stoneware is practically a roster of our leading institutions of learning, including among many others Yale, Harvard, Vassar, Radcliffe, Duke, Pittsburgh, Wesleyan, Lehigh, Tulsa, Toledo, Berea, Purdue, Vanderbilt, McGill, and the State Universities of Maryland, Illinois, New Hampshire, Connecticut, Indiana, Pennsylvania, Ohio, Wisconsin, Nevada, California, and California at Los Angeles. General Ceramics equipment is used also in such buildings as the Walter Reed Hospital in Washington, the Curtis Publishing Company Building in Philadelphia, and, in New York, the Times Building, Metropolitan Life Building, and United States Assay Office.

The General Ceramics line of stoneware equipment includes laboratory sinks, drain lines and fittings, sumps, fume ducts, pumps, ventilating fans, and countless other items.

Description

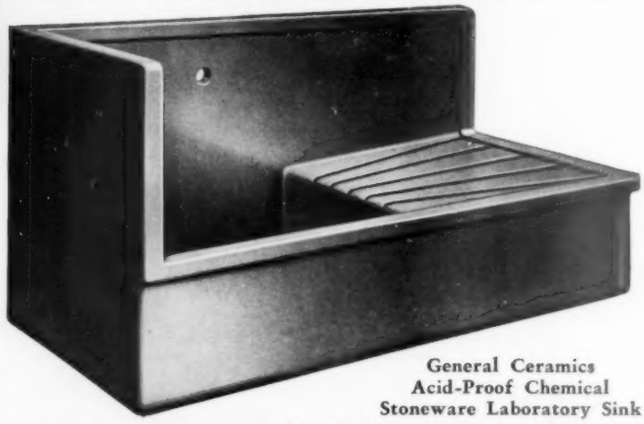
General Ceramics Chemical Stoneware is a dense granite-like material with an attractive glazed surface. Both the glaze and the body of the ware are completely impervious to all acids and other chemicals, excepting hydrofluoric acid. The surface glaze is an integral part of the ware itself and therefore free from crazing and cracking. General Ceramics Ware is mechanically strong, leak-proof, and easy to keep clean, and it cannot contaminate the chemicals handled. It lasts indefinitely and there is no upkeep or replacement expense.

Engineering Service and Catalogues

Our Engineering Department will gladly assist in selecting the right stoneware equipment for any requirements. We cooperate in laying out laboratories and other buildings where corrosive products are handled, also in the design of special chemical apparatus. A new Bulletin on General Ceramics Laboratory Sinks will be furnished gladly on request.

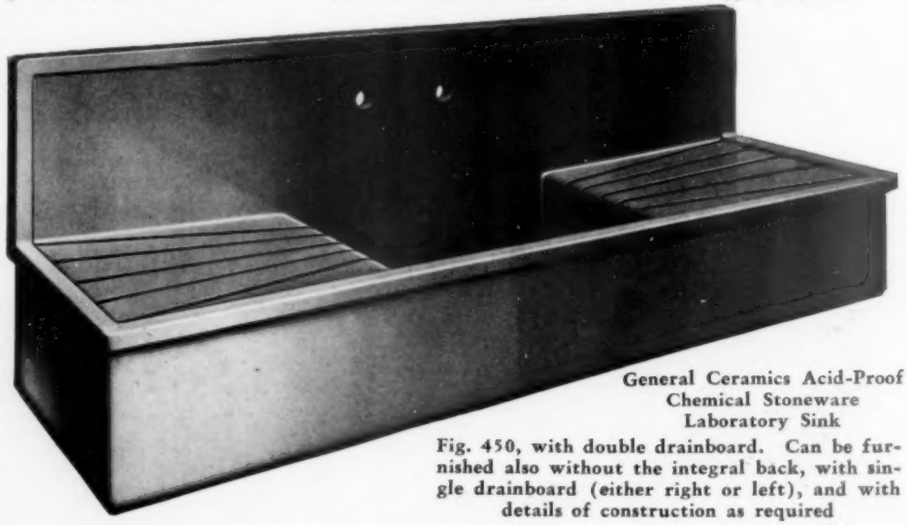
Specifications

Specifications should read as follows: "All parts of this installation subject to the action of acids or acid wastes are to be made of high-grade acid-proof chemical stoneware manufactured by the **General Ceramics Company** of New York."



General Ceramics Acid-Proof Chemical Stoneware Laboratory Sink

Fig. 454, with integral back and side. Can be furnished without back and side and in various other types and sizes



General Ceramics Acid-Proof Chemical Stoneware Laboratory Sink

Fig. 450, with double drainboard. Can be furnished also without the integral back, with single drainboard (either right or left), and with details of construction as required

MAURICE A. KNIGHT

Acid, Alkali and Corrosion Proof Chemical Stoneware

227 Kelly Avenue, Akron, Ohio

New York, N. Y. Cleveland, Ohio | Niagara Falls, N. Y. Chicago, Ill. | Detroit, Mich. St. Louis, Mo. | Los Angeles, Cal. Toronto, Can. | San Francisco, Cal. Montreal, Can.

PRODUCTS

Pipe and Fittings for Laboratory Waste Lines and Fume Ducts.

Custom Built One-piece Laboratory Sinks.

Laboratory Table Troughs.

Sumps or Dilution Basins.

Jars, Filters, Gas Generators, Tanks, Burner Guards, etc.

KNIGHT-WARE

Knight-Ware is an improved ceramic product having a dense, uniform body which is tough, thoroughly vitrified and wholly inert to the action of acids, alkalis, and corrosive solutions and gases, weak or strong, hot or cold. Its acid-proof qualities do not depend upon any glaze, enamel or veneer, "It is the body itself". Knight-Ware is not brittle or fragile as ordinary tile, and is equaled only by glass or fused silica in chemical inertness. An installation of Knight-Ware properly made is trouble-free and permanent.

SOME KNIGHT-WARE INSTALLATIONS

Columbia University
Princeton University
Purdue University
McGill University
Ohio State University
Johns Hopkins University
Wellesley College
University of California
University of Washington
West Virginia University
University of Arkansas
Mellon Institute of Industrial Research

KNIGHT-WARE LABORATORY SINKS

Knight-Ware sinks are custom built to suit your requirements. Because they are entirely handmade, it costs no more for this service. The one-piece construction, smooth surfaces, rounded corners and acid-proof quality means a freedom from leaks and a cleanliness that is highly desirable and, what is more, permanent. Outlets of various designs are furnished as an integral part of the sink or separately as desired.

KNIGHT-WARE ACID WASTE PIPE AND FITTINGS

Bell and spigot pipe and fittings are available in any bore from 1 up to 60 in. in any lengths up to 5 ft. Special fittings for unusual places or to eliminate unnecessary joints are furnished at little increase in cost. Flanged or plain ground end connections can be furnished where desired.

Knight-Ware B&S joints packed and poured to our specifications are absolutely acid and leak proof. Installation is no more difficult than with ordinary cast iron pipe. Knight-Ware is acid-proof, not just acid-resisting.

KNIGHT-WARE ACID VENTILATING PIPE AND FITTINGS

This pipe is furnished in round or rectangular cross section in bores of from 4 to 60 in. Bell and spigot, flanged, or plain ground butt end connections are available. Fume condensates are often more corrosive than the gas itself. Specify Knight-Ware for positive protection.

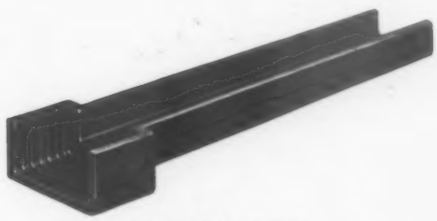
LITERATURE

Our 48-page catalog on Knight-Ware Laboratory Equipment containing complete details and fully illustrated will be sent upon request.

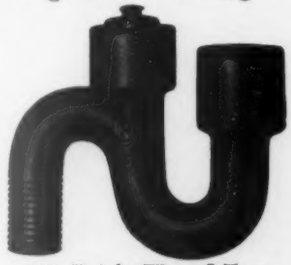
SERVICE

If you are building a new laboratory or refurnishing your present one, we offer you our knowledge and practical experience gained through scores of Knight-Ware installations.

End Table Sink with Cut-out Back for Trough



275A Table Trough



268 Knight-Ware S-Trap with Cleanout

E. I. DU PONT DE NEMOURS & COMPANY, INC.

DU PONT

GRASSELLI CHEMICALS DEPARTMENT

GRASSELLI

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There are four definite buying advantages when you specify Grasselli Reagents. They are:

(1) Constant uniformity . . . always dependable.

(2) Strictly chemically pure . . . the analysis is printed on each label . . . and conforms to A. C. S. specifications.

(3) Quick delivery . . . prompt shipment from our nearest branch (20 of them, all over the country).

(4) Convenient and economical shipping containers.

CONSTANT UNIFORMITY
STRICTLY CHEMICALLY PURE
ALWAYS DEPENDABLE

HAMILTON-INVINCIBLE, INC.

SALES AND GENERAL OFFICES
Two Rivers, Wis.
AUTHORIZED REPRESENTATIVES IN PRINCIPAL CITIES

ILLUSTRATED at the left is the standard 5 foot Instructors' Desk No. 1A-100. Other standard units can be supplied in 8 foot and 12 foot lengths with drawer and cupboard arrangements to meet individual requirements. Sink and accessory locations can be shifted and services added or removed as desired.

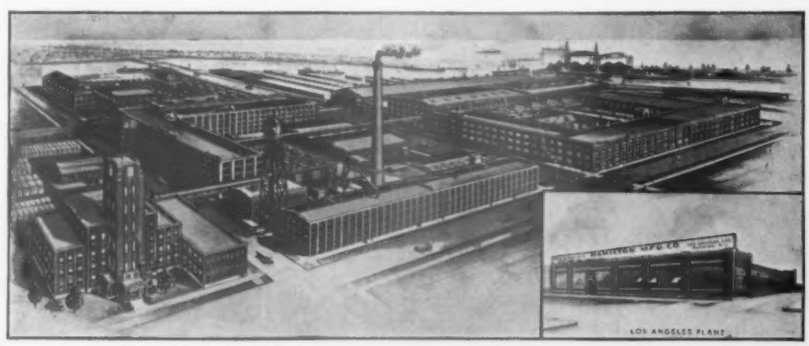
A New Standard in Flexibility and Utility

The table shown and described above is a typical example of the Hamilton-Invincible line.

The primary requisite confronting most school authorities when ordering furniture is utilizing working space economically. Hamilton-Invincible furniture is so designed that the various units can be interchanged to provide for maximum use of laboratory space.

In this capacity our engineering staff is at your service without obligation. Let us aid you in planning your laboratories and arranging equipment to fit your exact needs at a minimum expenditure.

Look over the complete line of modern Hamilton-Invincible laboratory furniture in our catalog. If you haven't a copy, write for it today.



● A birdseye view of main factory and general offices at Two Rivers, Wisconsin

HAMILTON-INVINCIBLE
LABORATORY VOCATIONAL AND LIBRARY FURNITURE

GENERAL RADIO COMPANY

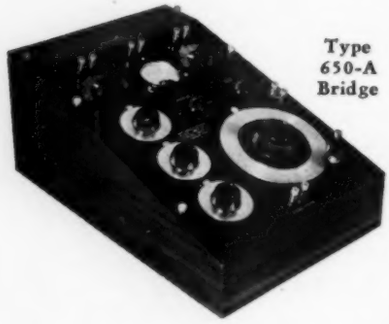
30 State Street, Cambridge, Massachusetts

Always with the needs of the college laboratory in mind, General Radio Company for over twenty-one years has manufactured a line of electrical and radio laboratory apparatus and accessories which has been accepted as the standard in the educational field.

General Radio products are noted for their advanced electrical design, high-grade mechanical construction, accurate calibration and conservative rating.

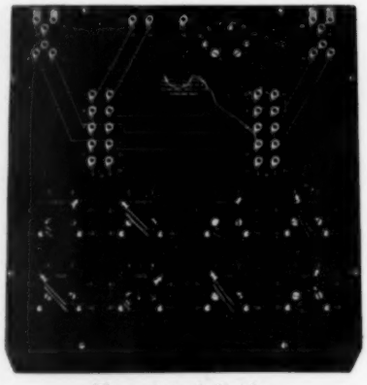
The following bridges and accessories are presented as representative instruments from the complete G-R line; instruments which the student upon graduating to commercial, industrial and research laboratories will be called upon to use regularly.

BRIDGES



Type 650-A Bridge

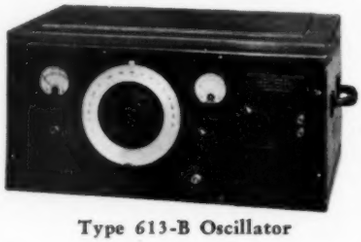
This self-contained bridge with built-in standards, oscillator and power supply is one of the most popular G-R instruments. It is always ready for immediate use and covers the following enormous direct-reading ranges with an accuracy more than adequate for practically all requirements. RESISTANCE: 0.001 ohm to 1 meghom; INDUCTANCE: 1 microhenry to 100 henries; CAPACITANCE: 1 micromicrofarad to 100 farads. In addition it directly measures dissipation factor $(\frac{R}{X})$ of condensers and energy factor $(\frac{X}{R})$ of inductors.



Type 293-A Bridge

This universal bridge presents a fundamental circuit which may be connected to produce a wide variety of standard direct- and alternating-current bridges for frequencies up to 50,000 cycles. The bridge is composed of three resistance arms brought out to appropriate terminals so that many circuit combinations may be set up with plugs and jacks. Appropriate standards are manufactured by General Radio. Price: Type 293-A Bridge, $140.00.

OSCILLATORS



Type 613-B Oscillator

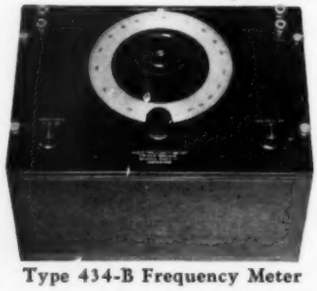
Among the several laboratory oscillators manufactured by General Radio the Type 613-B Beat-Frequency Oscillator has wide appeal in the college laboratory. It is a direct-reading, battery-operated instrument having good wave form, high frequency stability and an open scale. Its range is 10 cycles to 11,500 cycles. The open-circuit output voltage is 16 volts ± 20% over its entire range. Price: Type 613-B Oscillator, $210.00.

AMPLIFIERS

Type 814-A Amplifier

This is a general-purpose battery-operated laboratory amplifier for use where high gain over the entire audio frequency range is desired. The sensitivity of the usual head telephone is increased by nearly 80 db at 1,000 cycles when this amplifier is used. The gain is practically constant between 20 and 10,000 cycles and the useful range extends to 50 kilocycles. Price: Type 814-A Amplifier, $97.50.

FREQUENCY METERS



Type 434-B Frequency Meter

This audio-frequency meter provides a means of measuring frequencies between 20 and 20,000 cycles. Each instrument is individually calibrated and direct reading to an accuracy of 0.5 per cent. When used with the Type 814-A Amplifier the meter may be set to 0.1 per cent. Either head telephones or an amplifier and output meter may be used as the null indicator. Price: Type 434-B Audio-Frequency Meter, $140.00.

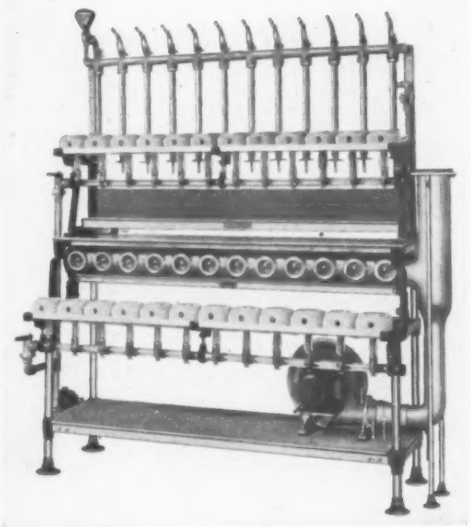
Write for Catalog JS

The complete line of General Radio laboratory equipment is described in Catalog JS. It includes many other bridges, oscillators, cathode-ray oscillographs, frequency meters and standards, inductance, resistance and capacitance standards, stroboscopic devices and a very large number of standardized parts and accessories widely used in the leading educational institutions throughout the entire world.

LABORATORY CONSTRUCTION COMPANY

1113-1115 Holmes Street, Kansas City, Missouri, U. S. A.

Specializing in the Manufacture of Complete Units of
KJELDAHL NITROGEN APPARATUS
and Associated Equipment



12-Flask Capacity Combination Unit of Digestion and Distillation, Gas Equipped. Overall Dimensions: 2′ 0″ x 6′ 2½″ x 7′ 0″ high

DOES NOT REQUIRE A FUME HOOD

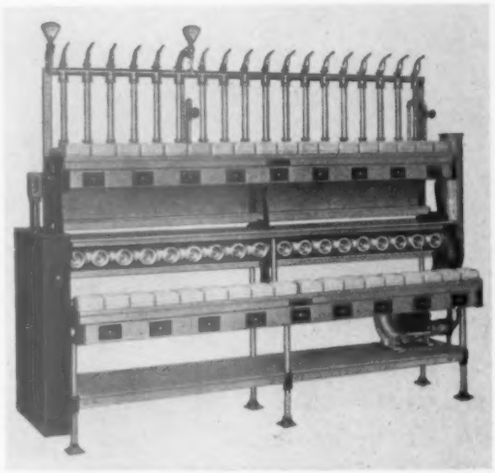
Operates in the open room without escaping fumes, without open drains or drip on table top or floor, without flanges or creeping condensation, without fumes in contact with the blower.

SIMPLE INSTALLATION

Compact units make it easy to place. After placement you have only your **main** connections to bring to the apparatus. The completeness materially reduces the usual installation cost for apparatus of this nature.

Combination digestion and distillation units in capacities 6 to 24. Separate units in capacities 6 to 48. All electric, all gas or units of both.

Many unique arrangements are available to save floor space and fit the particular need of your laboratory.



18-Flask Capacity Combination Unit of Digestion and Distillation, Electric Equipped. Overall Dimensions: 2′ 0″ x 8′ 11¼″ x 7′ 0″ high

DIGESTION UNIT

PATENTED FEATURES OF EFFICIENCY, CLEANLINESS AND DURABILITY—A heavy duty reinforced fume tube with patented inserted, inwardly projecting flask sockets formed integrally therewith and lead burned with smooth finish. These flask sockets have internal drain and confine all condensation drip inside the fume tube. Ample drain pipes collect condensation from fume tube and stack.

BALANCED SUCTION—Patented wall closed nozzle air ejector eliminates back drafts and produces a uniform suction to each flask socket.

ADEQUATE FUME DISPOSAL—Variable speed motor with shift lever to regulate volume of air for unusual outside air conditions.

DISTILLATION UNIT

MAXIMUM DISTILLING UNIT—All brass manifold and tubular condensers operating under the thermo-siphon system insures even temperatures and uniform area of water circulation without air pockets. For higher efficiency the water circulation is in direct contact with the block tin tubes. The assembling is with packing nuts and bushings. Tested for 80 lb. water pressure. No soldering is used anywhere on the condensers.

TEMPERATURE REGULATING—Indicating thermometer with automatic electric buzzer for warning of too high water temperature. (a) Hand control valve for water supply.

LONGER LIFE FOR BLOCK TIN TUBES—Brass castings to support and hold block tin tubes. These supports prevent twisting and bending of tubes when making the flask connection.

At your request we will send you, without obligation on your part, shop drawing showing overall dimension and minute detailed specifications covering any arrangement and capacity you might request—either combination or separate units

"LABCONCO" WIDE RANGE GAS BURNER

An Efficient and Flexible Gas Burner for General Use

The "Labconco" Gas Burner was designed by us for use on our modern Kjeldahl nitrogen apparatus and its wide range adjustment makes it also adaptable for specific individual use.

A DURABLE GAS BURNER . . .
IMPROVED TYPE DIFFUSER
Positive Adjustment for Both Air and Gas . . . Individual Cut-off
All Brass—Finished in White Nickel

A special folder descriptive of this burner will be sent on request

A Compact Laboratory Heater. Dimensions: 5″ x 5″ x 3⅜″. Molded from Heat Resisting Electrobestos

GOLDFISCH ELECTRIC HEATERS

Famous for Uniform Heat

No wide variation of wattage in a battery of Goldfisch Electric Heaters. Each individual heater is tested for wattage, permitting its use in batteries with a variation not to exceed 2 per cent on constant voltage.

A special folder descriptive of this heater will be sent on request

EXTRACTION AND CRUDE FIBER APPARATUS, INDIVIDUAL SUCTION FUME HOODS AND LABORATORY TABLES, CARTS AND ACID DISPENSING STANDS — COMPLETE INFORMATION ON REQUEST

LABORATORY FURNITURE CO., INC.

Long Island City, N. Y.

Manufacturers — Engineers

USED IN THOUSANDS OF THE COUNTRY'S FINEST LABORATORIES

The "STEELAB" Line of Sectional Laboratory Furniture lends itself efficiently and economically to the average laboratory layout. Our factory is completely equipped for the production of special equipment to meet your requirements.

Our Engineering Service Department will assist you in the planning of your laboratory, offering you without obligation years of experience in modern and practical planning.

Write for "STEELAB" Catalog

Chemistry Laboratory, St. Joseph College, Hartford, Conn.

Home Economics Laboratory, St. Joseph College, Hartford, Conn.

Pulp and Paper Laboratory, College of Forestry, Syracuse University, Syracuse, N. Y.

SPENCER LENS COMPANY

Buffalo, New York

Manufacturers of

Microscopes — Microtomes — Delineascopes

BRANCHES

New York Chicago Boston San Francisco Washington

SPENCER MICROSCOPES FOR HIGH SCHOOL AND COLLEGE USE

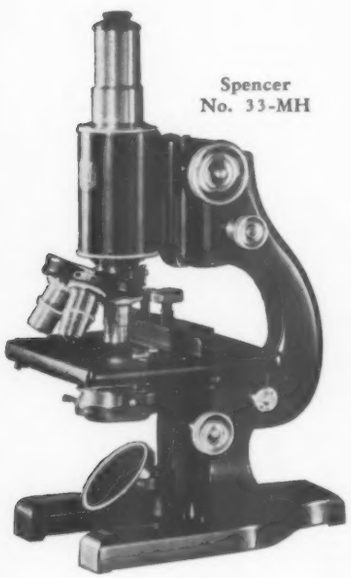
The Spencer Lens Company have been pioneers in microscope-building, the first Spencer microscopes being made more than 75 years ago. They were the first to build apochromatic objectives; the first, and for a dozen years the only, manufacturer in America to build microscopes with side fine-adjustments; the originators of the attachable mechanical stage that clamps on the side of a microscope; the originators and only builders of fork-type substages, converging tube binocular microscopes, combination binocular and monocular body all in one, combination substage condenser and dark-field illuminator. In short, most of the improvements in microscope construction during recent years have originated in our factory.

Most laboratory workers prefer Spencer microscopes not merely because the Spencer Lens Company were pioneers, but because they have continued to pioneer all down through the years to the present day.

Spencer
Nos. 55 and 56

SPENCER NOS. 55 AND 56

These exceptionally large instruments meet in a most satisfactory way the demand for a large stage. The plate glass stage is 100 mm. x 100 mm. Objects in the center of a dish 50 mm. high and 130 mm. in diameter may be brought into the line of vision.



Spencer
No. 33-MH

SPENCER NO. 33-MH

Embodies all features essential for practical diagnosis. Features the exclusive Spencer constructional advantages: (1) Balanced Optical System, (2) Dual-Cone Nosepiece, (3) Fork-Type Substage and (4) new Rhodium Plated Parts. Mechanical stage has range sufficient to cover 3″ x 2″ microscope slide. Has micrometer fine adjustment with twenty-seven threads completely engaged. It is the finest microscope for the medical student's use.

SPENCER NO. 66

For elementary work, precisely built and durable, it serves the same purpose as more expensive instruments. Standard size in every respect. Standard Spencer objectives and eyepieces; rotatable disc diaphragm. Fine adjustment has twenty-seven threads of the screw engaged instead of the usual six. Simple in operation, it is the finest instrument for students untrained in handling a microscope.

Spencer
No. 66

F. J. STOKES MACHINE COMPANY

5960 Tabor Road (Olney P. O.), Philadelphia, Pa.

BRANCH OFFICES

New York Chicago Cincinnati San Francisco Los Angeles

PRODUCTS

Water Stills	Distilling Apparatus
Vacuum Shelf Dryers	Autoclaves
Vacuum Rotary Dryers	Mixers
Vacuum Evaporators	Kettles
Atmospheric Shelf Dryers	High Vacuum Pumps
Tablet Machines	

Stokes No. 171 One Gallon Automatic Water Still. Gas-heated model

WATER STILLS

For the economical production of distilled water of exceptionally high chemical and bacteriological purity for chemistry, biology and physics laboratories, this Stokes No. 171 Still has a number of exclusive features which assure the high quality of the distillate as well as increase convenience of operation.

Among the features of this still are a Pyrex glass cover, triple vapor baffle, solid block-tin condenser tube, gas eliminator, deconcentrator (especially important in hard water districts) and, in the case of the electrically-heated still, a patented dual-purpose safety device which protects the heating element.

This still—of modern laboratory finish—is supplied steam, gas or electrically-heated with a wall bracket, though floor stand is available. It is easy to install and clean and operates automatically. The capacity is one gallon per hour. More than 20 standard models from ½ to 100 gal. per hour capacity are available. There are over 17,000 Stokes Stills in use. Write for literature and quotations.

Small laboratory model Autoclave suitable for research and experimental use

AUTOCLAVES

We supply autoclaves for laboratory work, designed to meet the exact requirements presented by the individual problem. Cast iron, cast steel, bronze, monel metal, and other special materials are used when required. Heated by steam, gas or electricity. Supplied with or without agitators. Special heating methods and types of construction suitable for high pressure operation.

Stokes No. 51 Laboratory Vacuum Shelf Dryer

DRYERS

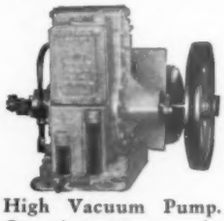
The No. 51 Laboratory Vacuum Shelf Dryer is very useful in industrial and research laboratories, technical schools and universities for vacuum drying or evaporating chemical, pharmaceutical, food and similar products sensitive to heat or oxidation. This apparatus is also useful for drying hygroscopic materials not readily dried in an atmospheric type oven.

The design is ingenious and very compact with the condenser and receiver making up the stand for the vacuum chamber itself. The vacuum chamber is of special cast iron and contains two 18″ x 14″ shelves with 4″ clearance between them. The vertical surface condenser is of the efficient counter-current type with necessary inlet and overflow for the cooling water. After condensing, the moisture or solvent removed is collected in a receiver beneath the condenser forming the base of the stand. Each dryer is self-contained as illustrated and is supplied complete with vacuum gauge, vacuum-break valve and either thermometer or steam pressure gauge. The finish is of gray enamel with hand wheels, sight glass covers and fittings nickel plated to present a neat appearance suitable for laboratory installation.

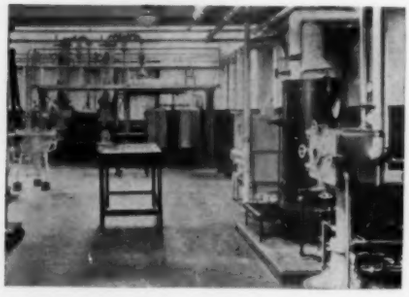
With the No. 51 Laboratory Shelf Dryer the same results are obtainable as with large plant size dryers. Heating is by steam or hot water with the necessary auxiliaries.

HIGH VACUUM PUMPS

Produce a vacuum within .01 mm. of absolute; quiet in operation, rugged and dependable. Self-contained, of the rotary oil-sealed plunger type, they are simple and compact. May be equipped with continuous oil clarifier. Arranged for motor drive. Sizes from 10 to 225 cu. ft. displacement stocked.



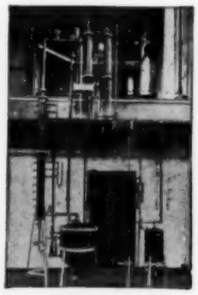
High Vacuum Pump. Capacity 10 cu. ft. per min.



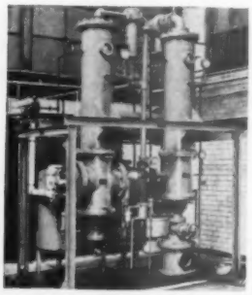
Instaliation view in Princeton chemical engineering laboratory. Note Double-effect Evaporator and No. 51 Vacuum Shelf Dryer. Fractional Distilling Apparatus not shown. Similar equipment installations made in several university laboratories

SPECIAL EQUIPMENT

For a number of chemical engineering laboratories we have supplied special equipment of the type illustrated. This apparatus is built to specifications and our chemical engineers are available to work out with laboratory directors the apparatus and auxiliary equipment. Write us concerning your requirements.



Fractional Distilling Apparatus specially designed so that all engineering data can be obtained—as installed at several universities



Double-effect Evaporator in the laboratory of the University of Pennsylvania. Arranged so that either effect can be operated independently. Second effect arranged for crystallizing

THE UNITED STATES STONEWARE CO.

Works (Since 1865): Akron, Ohio — NEW YORK OFFICE: 60 East 42nd Street

LOS ANGELES: Hollingsworth Building — CHICAGO: 20 N. Wacker Drive — SAN FRANCISCO: 116 New Montgomery Street

Acid-proof Chemical Stoneware Laboratory Sinks

"U. S. **Standard"** Acid-proof Sinks are widely used in laboratories of universities, schools, hospitals and industrial companies.

The construction is **one-piece,** without seams or joints. The material is non-porous and non-absorbent. The corners are well-rounded and the surface smooth. Special sizes can be made to fit any desired space.

Glaze—Our exclusive "Hy-Gloss" salt glaze has a high lustre, dark brown finish and is an integral part of the body itself.

Guarantee—Our products are unconditionally guaranteed to be acid, alkali and corrosion proof throughout the body, with or without the salt glaze.

Bulletin—Write for Bulletin No. 504 giving full information.

TRADE-MARK

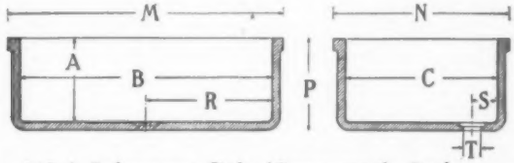


Fig. 112-A Laboratory Sink (Countersunk Outlet to take Metal Plug).

Fig. 112-ASP, Ditto, but with Integral High-Back.

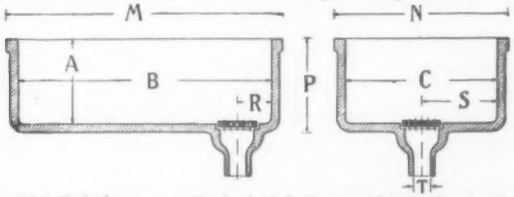


Fig. 112-B Laboratory Sink (with Integral Nipple Outlet and Removable Strainer).

Fig. 112-BSP, Ditto, but with Integral High-Back.

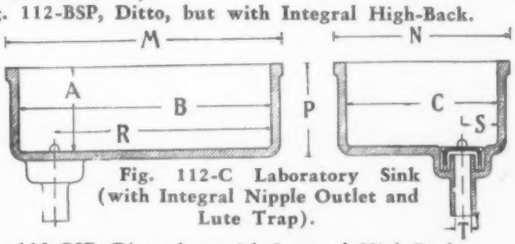


Fig. 112-C Laboratory Sink (with Integral Nipple Outlet and Lute Trap).

Fig. 112-CSP, Ditto, but with Integral High-Back.

DIMENSIONS OF "U. S. STANDARD" ACID-PROOF SINKS

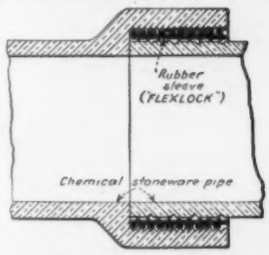
Size No.	B	C	A	M	N	P	Code Word
700	11	9	8	14	12	9	Tab
701	14	10	6	17	13	7	Tacit
702	16	8	6	19	11	7	Tack
703	15	14	6	18	17	7	Taffy
704	16	12	6	19	15	7	Tag
705	16	16	9	19	19	10	Tale
706	18	10	11	21	13	12	Talon
707	18	14	7	21	17	8	Tamp
708	18	14	10½	21	17	11½	Tang
709	18	16	6	21	19	7	Tape
710	20	12	7	23	15	8	Tally
711	20	12	12	23	15	13	Tar
712	20	16	7	23½	19½	8¼	Taunt
713	24	15	8	27½	18½	9¼	Tenor
714	32	16	7	35½	19½	8¼	Terse
715	30	20	8	33½	23½	9¼	Thumb
716	36	18	7	39½	21½	8½	Tiger
717	42	20	12	45½	23½	13¾	Toast

Integral Backs on No. 700 to No. 709 sinks (dimension "E" on Fig. No. 112-ASP) are 8 in. high and are 10 in. high on the larger sizes. **Special sizes can be made to order.**

Other Products—Laboratory Table Troughs, Hemispherical Sinks, Sumps or Dilution Basins, Kjeldahl Equipment, Gas Generators, Laboratory Chlorine Cells, Suction Filters, Acid-proof Jars and Tanks, Burner Guards, Laboratory Jar Mills, Funnels, Exhaust Fans, etc.

Acid-proof Chemical Stoneware Piping

Patented "FLEXLOCK" Rubber Joints make a perfect and economical joint between two pieces of Chemical Stoneware Pipe. Equally satisfactory for vertical and horizontal drainage and fume duct lines. "FLEXLOCK" Joints are the ONLY joints insuring all these advantages: **Positive seal**—No joint leaks. **Flexibility**—Takes care of expansion and building vibration. **Installation ease**—No other joints can be made so quickly. **Permanence**—No joint replacements. **Low installation cost**—Cheaper per laid foot than poured joints. **Unaffected by any field**—Even handles solvent hydrocarbons.



Cross-Section of "FLEXLOCK" Rubber Joint for Bell-and-Spigot Pipe

There is no other commercial product which is more universally resistant to acids, alkalis and corrosive chemicals and gases. Bromine, ferric chloride, sulphuric, sulphurous, nitric and hydrochloric acids of any concentration, can all be handled with perfect safety.

The hubs are 4-in. deep and both the spigot and hub ends are deeply corrugated. Standard pipe lengths are 60 in. and are guaranteed straight and accurate.

Our line is complete, including elbows, bends, Y's, TY's, traps, crosses, sumps, floor drains, etc.

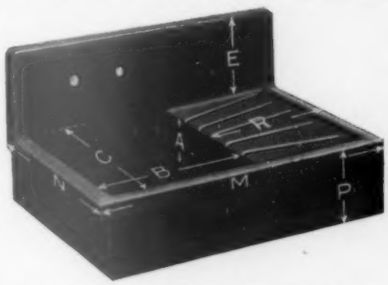
ACID-PROOF SINKS WITH INTEGRAL DRAINBOARDS

(One-piece)

Fig. 533-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 533-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 533-CSP (with Integral Nipple Outlet and Built-in Lute Trap).



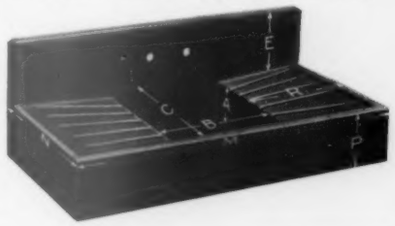
Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word	List Prices f. o. b. Factory Fig. 533-ASP	Fig. 533-BSP	Fig. 533-CSP
307	18	14	7	8	37½	16½	8⅞	18	197	Tong	$50.00	$61.00	$66.00
312	20	16	7	10	39¾	19	9⅛	18	285	Tope	52.00	63.00	68.00
313-A	24	18	8	10	43¾	21	10⅛	18	348	Tory	61.00	75.00	79.00
315	30	20	8	10	49¾	23	10⅛	18	410	Tuch	83.00	97.00	101.00

Above list prices are for sinks with drainboards at right hand or left hand. Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral backs and sinks without integral backs can also be supplied. *List prices subject to discount.*

Fig. 536-ASP (with Countersunk Outlet to take Metal Plug).

Fig. 536-BSP (with Integral Nipple Outlet and Removable Strainer).

Fig. 536-CSP (with Integral Nipple Outlet and Built-in Lute Trap).



Size No.	B	C	A	E	M	N	P	R	Shipping Wt., Lbs.	Code Word	List Prices f. o. b. Factory Fig. 536-ASP	Fig. 536-BSP	Fig. 536-CSP
507	18	14	7	8	54	16½	8⅞	18	284	Trew	$76.00	$91.00	$96.00
512	20	16	7	10	56	19	9⅛	18	402	Trig	78.00	93.00	98.00
513-A	24	18	8	10	60	21	10⅛	18	477	Trow	92.00	108.00	114.00
515	30	20	8	10	66	23	10⅛	18	546	Tude	125.00	141.00	145.00

Special end table sinks can be made up with back cut out for trough drainage. Corner sinks with double integral backs and sinks without integral backs can also be supplied. *List prices subject to discount.*

WESTON ELECTRICAL INSTRUMENT CORP.

601 Frelinghuysen Avenue, Newark, N. J.

ENGINEERING AND SALES OFFICES

Albany	Cleveland	Jacksonville	Minneapolis	Pittsburgh
Atlanta	Dallas	Kansas City	Newark, N. J.	Rochester
Boston	Denver	Knoxville	New Orleans	St. Louis
Buffalo	Detroit	Los Angeles	New York	San Francisco
Chicago	Honolulu, T. H.	Meriden, Conn.	Philadelphia	Seattle
Cincinnati				Syracuse

WESTON—THE WORLD'S STANDARD IN ELECTRICAL MEASUREMENT

The use of WESTON instruments in educational work and scientific laboratories has become a fixed principle, for nothing short of WESTON accuracy and dependability are acceptable for engineering training. WESTON instruments are made to most exacting standards of craftsmanship and accuracy. They inspire students to be exact in experiments. And in using WESTONS in training, the student is familiarizing himself with the instruments he will use all through his engineering career, for student graduates since 1888 have "Westonized" the industrial world.

Illustrated are a few of the many WESTON models particularly recommended for educational use. Catalogs describing all models are available.

MODEL 607

***Photronic Photoelectric Relay**

Ideal to demonstrate the theory and operation of photoelectric cells and sensitive relays. Consists of a WESTON Photronic Cell of the self-generating type, a WESTON Sensitive Relay and a Power Relay. The cell has permanent electrical characteristics and unlimited life. No outside voltage, nor troublesome amplifier required. All mounted on a common base and wired. Wiring diagram engraved on base. Low priced.

MODEL 622

Ultra-Sensitive Microammeters, Millivoltmeters

Double pivoted type instruments—requiring no leveling—for measurement of minute currents. Low ranges down to 5 microamperes statically shielded. Ranges up to 20 microamperes magnetically and statically shielded. Ideal for laboratory work and circuits involving thermo - couples, pyrometers, electron tubes, etc.

MODEL 280

Miniature Precision D.C. Instruments

Most convenient and practical for student use, combining miniature size and WESTON ruggedness. Size 4⅖ x 4⅗ x 1½ inches. Accuracy 1% . . . hand calibrated mirror scales and knife-edged pointers . . . shielded from external magnetic fields. Available in multi-range instruments so that a variety of testing can be done with one instrument.

MODEL 430

Portable, Precision A.C. and D.C. Instruments

Universally used in schools and throughout industry wherever rugged, portable instruments are required for general testing. Hand calibrated, mirror scales with knife-edged pointers. Size 5$\frac{1}{16}$ x 6$\frac{1}{32}$ x 3½ inches. The line includes D.C. instruments, A.C. instruments and single phase Wattmeters.

MODEL 375 — Student Galvanometer

Model 375 is widely used in school laboratories where durability and low cost are prime requirements, rather than extreme sensitivity. Sensitivity 22 microamperes per division, resistance 23 ohms.

Model 699 Calvanometer is recommended where medium sensitivity is required . . . and the Model 440 wherever an exceedingly sensitive instrument is required. Complete literature on all models available.

* Photronic—A registered trademark designating the photoelectric cells and photoelectric devices manufactured exclusively by the Weston Electrical Instrument Corporation.

SECTION IX
SHOP PLANNING AND EQUIPMENT

PROGRAM AND EQUIPMENT FOR INDUSTRIAL EDUCATION IN A PROGRESSIVE SCHOOL

BY IRVIN S. NOALL

State Director of Vocational Education, Utah

THE Progressive School is entitled to this classification by virtue of its success in adapting objectives and methods to current problems. Industrial education in a progressive school will serve the needs of today and will change tomorrow to meet the needs of the new day.

Its program will therefore be based upon the needs of industry as they may become apparent, and upon social standards as they may evolve. Robert O. Beebe, Director of the Vocational Schools in Essex County, N. J., in the 1935 Edition of THE AMERICAN SCHOOL AND UNIVERSITY,* called attention to the shift of emphasis in industry from the metal trades during the war period to the building trades during the post-war period, and again to new industries such as radio, air conditioning, welding, etc., at a still later date.

The progressive school has moved its vocational training program from the ninth and tenth grades up to the eleventh and twelfth grades. In Oakland and Los Angeles it has moved right out into the post-high-school period. This has greatly simplified the public school relations and has made possible a singleness of purpose which promises new standards and achievements in the field of industrial education. The point is that since the purpose of the progressive school is to train for entrance into industry, the training program will be moved up to such an age that its students will become employable upon completion of the school course.

Several years ago David Snedden wrote an article, called "A New Deal for Vocational Education," in which he proposed a post-high-school training institution which would carry its students up to possibly 90 per cent of journeyman competence. This may be too high, but recent social and industrial changes are delaying entrance into employment and naturally will delay completion of apprenticeship until the student is 22 to 24 years of age, unless the new school, through superior instruction and experience, is able to prepare the older student to complete his trade in fewer years. This undoubtedly should be possible.

Building for Specialization

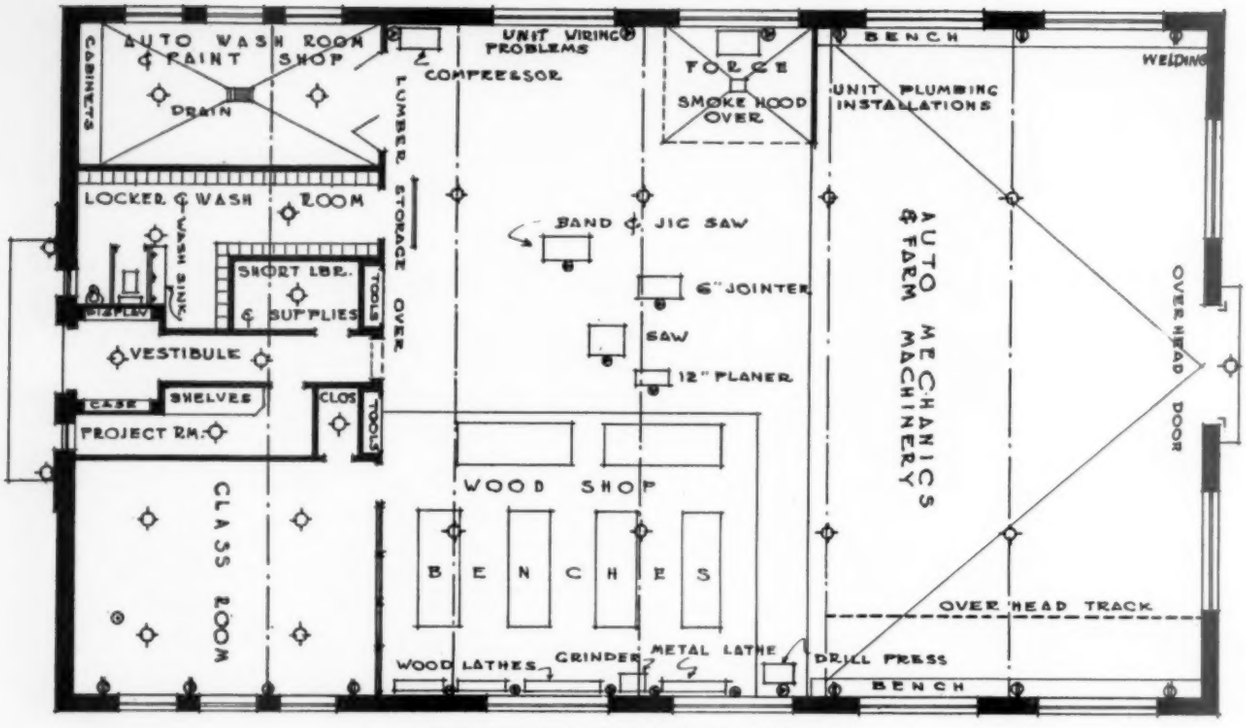
There has been much disagreement among leaders of labor, industry and education over the question of specialized versus general training. Technological changes seem to demand versatility of adjustment into new job situations, but many branches of industry are even now in process of further specialization. The progressive school will seek to reconcile these differences by giving a broad foundation training upon which it will attempt to build specialization which is immediately marketable.

A second aspect of this conflict grows out of the practical difficulty the school will encounter in providing the instruction and equipment required for specialties and for new inventions and processes. The factory can figure the cost of obsolescent machinery in terms of the finished product. The progressive manufacturer may easily take trade from those who delay change. The school, drawing upon public support, will encounter difficulties in following a similar course.

The progressive school will find three avenues of action open. The first is to keep up with the changes in industry, no matter what the cost. This plan has marked limitations. The second course is to establish such relations with industry that equipment may be loaned or given for training purposes. Inasmuch as a training burden is being lifted from industry, it is not unfair to press this proposition.

A third plan must be resorted to in either event, namely, transfer of much of the specialty training to industry. This will be done in part by giving job instruction in the plant, but chiefly through technical training given in the school on part-time or evening-school basis.

* "Planning the Vocational School Plant for Future as Well as Present Needs," page 350, Seventh Edition.



A VERSATILE SHOP FOR A SMALL SCHOOL *

This shop (60 x 100 feet) will serve the needs of schools up to 400 enrolment and will take care of both urban and rural problems

The program of coordination in industrial education which is now in process of development in progressive schools will do much to assist the school, not only in maintaining its program in terms of present needs and future changes, but also in helping both to secure equipment and to develop feasible plant training programs.

In years past, there has been a wide gap between the so-called engineering profession and the associated trades and industrial occupations. Many men who had been trained for engineering positions found themselves in positions which might be called high-grade operative or perhaps semi-professional jobs. The progressive school appraises the qualifications required and gives training according to needs. In the future, it will be a reflection upon the school when any considerable number of graduates take positions below their level of training.

Layout of the Plant

Suggestions for the plant for a progressive school have been outlined in the 1935 and 1936 editions of this yearbook by Messrs. Beebe and Jeffrey.† The building should be of factory type construction with supporting outer walls and adequate floor construction to carry equipment and work in process. Partitions should be of temporary nature to permit room or floor space according to the demand. Ducts for electricity, water, gas, etc., should be so constructed as to permit of maximum flexibility in the assignment of room space or the placement of equipment. Auxiliary space, such as locker rooms, supply rooms, and tool crib, may well utilize the room height by balcony construction.

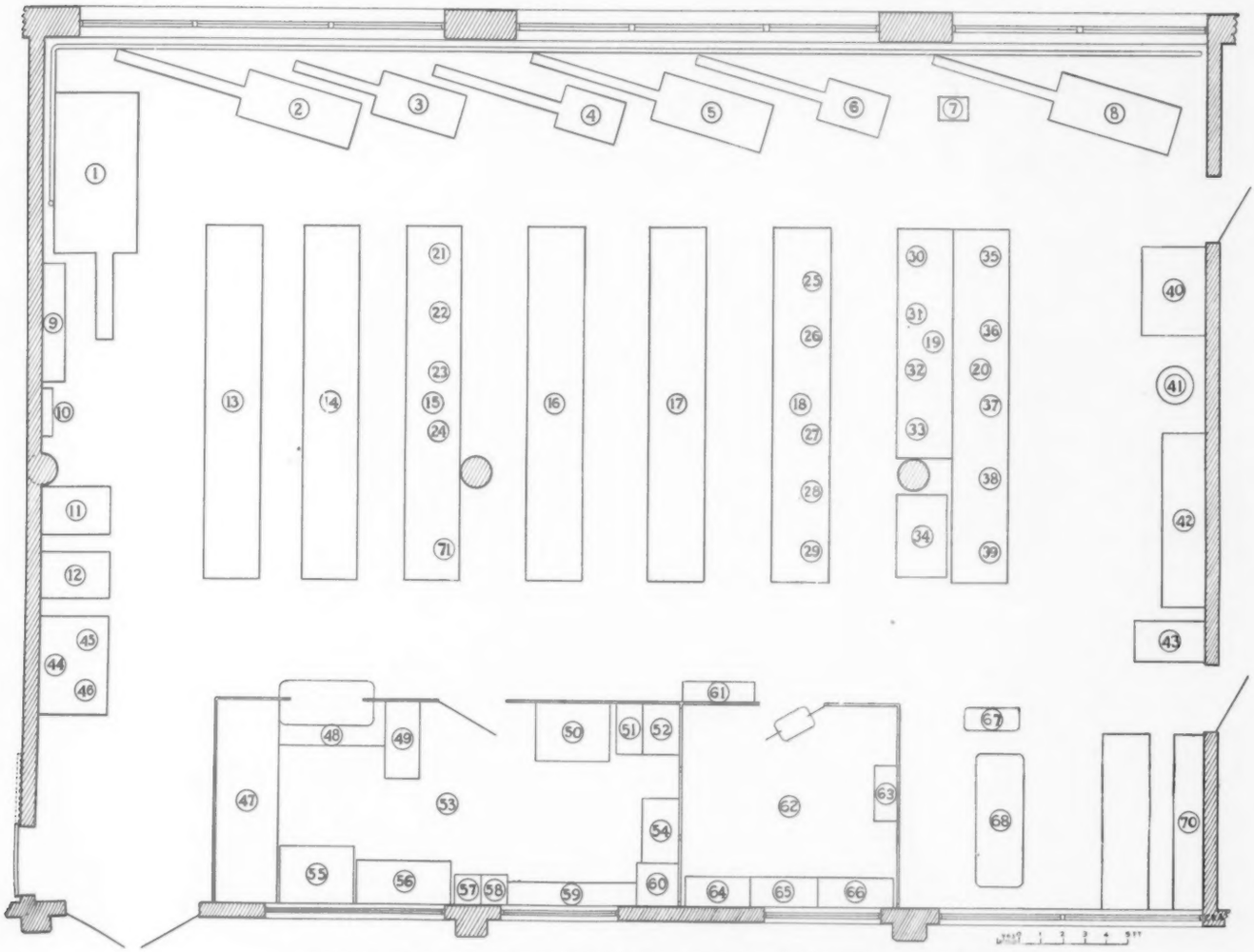
Unit space standards for different types of work are yet to be worked out. Every situation which provides more or less space than the work in hand requires constitutes a cost factor which is inexcusable in a progressive school. For instance, if the work-bench space in a wood shop is 10 feet square, individual benches with proper work space between will require 45 square feet per student, not including machinery, assembly space, etc.; whereas, the same amount of bench space consolidated into a large bench, say 4 x 10 feet, designed to accommodate four students, will require only 28 square feet per student.

The automotive shop should be figured in terms of unit space per car, say 9 or 10 feet by 20 feet, plus drives, auxiliary rooms, etc. There is also a question of policy involved in the number of cars required per class or per day for several class groups. So far as known by the writer, this factor has not been satisfactorily established. The progressive school will need to become an experimental institution which will test good practice under control condition for the general information of the entire field.

One frequently finds schools with heavy investments

* First-floor plan, Mechanic Arts Building, Snow College, Ephraim, Utah. Lorenzo S. Young, Architect, Salt Lake City, Utah.

† "The Physical Plant for a Modern Program of Vocational Education," by F. J. Jeffrey, Assistant Superintendent of Instruction, Board of Education, St. Louis, Mo.; page 413, Eighth Edition.



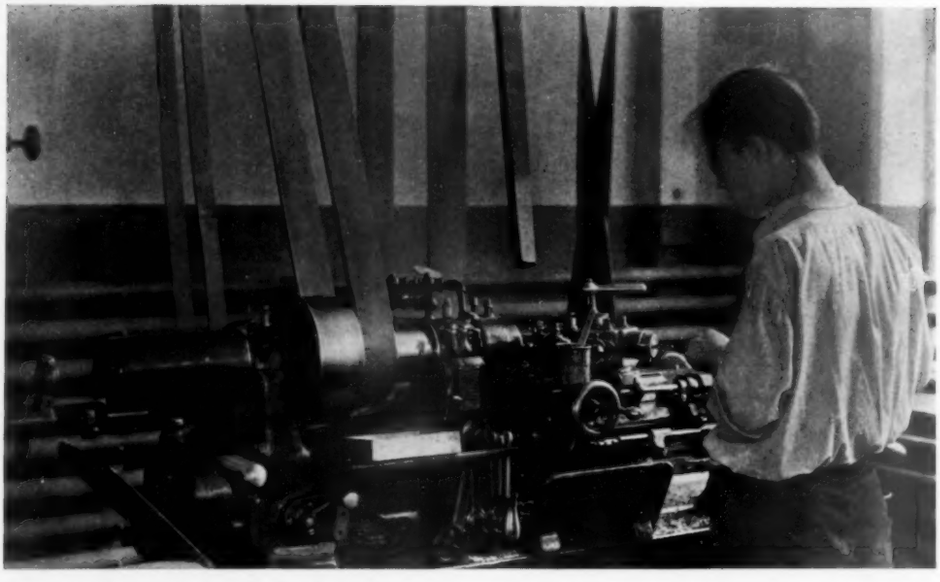
LAYOUT OF FACTORY PRODUCTION SHOP, GENERAL VOCATIONAL DEPARTMENT (MULTI-OCCUPATIONS), ESSEX COUNTY VOCATIONAL SCHOOLS, ESSEX COUNTY, NEW JERSEY. FLOOR AREA, 39 FEET 6 INCHES BY 53 FEET 6 INCHES

LIST OF MACHINES, BENCHES AND OTHER EQUIPMENT AS NUMBERED ON LAYOUT

1, 2, 3, 4. Hand screw machines
5, 6. Automatic screw machines
7. Tool grinder
8. Spindle screw machine
9. Stock rack
10. Panel box
11, 12. Foot presses
13. Bench—progressive assembly
14. Bench—sub-assembly
15. Bench—hand presses and assembly
16, 17. Benches—bench work with vises
18. Soldering bench
19, 20. Machine benches
21, 22, 23, 24. Hand presses—used for bending, forming, and tapping operations
25. Tinning pot
26, 27. Blow pipes
28, 29. Soldering furnaces
30. Milling machine
31. Bench lathe
32, 33. Sensitive drill presses
34. Truck for general shop use
35. Scratch brush
36. Grinder
37. Sanding disk
38. Buffing and polishing head
39. Jig saw
40. 4-spindle drill press
41. Pedestal drill press
42. Wood turning lathe
43. Rack for flat stock
44. Bench (welding)
45, 46. 1-kw spot welders
47, 48. Benches—sorting and inspection
49. Bench—for job sheets and blueprints
50. Desk—planning clerk
51, 52. Filing cabinets — job sheets — blueprints—reference materials
53. Planning and inspection room
54. Cabinet—for finished parts
55. Drawing table for planning and scheduling work
56. Bench—for planning and scheduling work
57, 58. Lockers—instructor's use
59. Cabinet—for finished parts
60. Stand—utility
61. Cabinet—for work boxes
62. Tool crib
63, 64, 65, 66. Tool cabinets
67. Drinking fountain
68. Wash sink
69, 70. Stock racks
71. Eyeletting machine

NOTE: Items 1 to 6 and 8 are used mainly for evening school and part-time instruction in screw machine set-up work. Day-school instruction for general vocational students is limited more or less to the operation of two semi- and one full-automatic.
Items 50, 55, and 56 are used by machine-shop boys who are taking advanced study in manufacturing methods and theory.

Spot Welder



Hand Screw Machine

Inspection

Photographs on this page and plan on preceding page furnished by Essex County Vocational Schools, New Jersey

in machinery which is given only incidental use; or again, one may find meager equipment giving double-duty service. Educators in the field of industry have not pooled their experience, or combined their judgment as to what constitutes adequate equipment, either as to amount, variety, or make. An attitude of experimentation with records of methods, means and results will characterize the progressive school. Some industries secure the services of efficiency experts or production engineers to work out these problems. Standards of equipment, arrangement for routing, unit space requirements carefully developed by the school, might well constitute a valuable service to industry where efficiency experts are not available.

It is obvious that schools in large centers can, and no doubt will, offer a rich variety of training in unit shop departments. These will continue to center around the so-called aristocratic trades. The general industrial shop has been developed to meet the need of these occupations in the smaller centers. The general industrial shop type of organization offers promise of training service in large centers in a wide range of occupations where the demand is either less specialized or less frequent.

Some of the New Jersey vocational schools are making a notable contribution in this field. California will also have something to offer from the work being done at Stockton and Berkeley, where prospectors, bakers, cosmetologists, and persons engaged in numerous other occupations may come for help on their specialized problems.

GENERAL SAFETY RECOMMENDATIONS FOR THE SCHOOL SHOP *

BY PAUL L. CRESSMAN

Director, Bureau of Instruction,
Department of Public Instruction, Harrisburg, Pa.

Belts

Never attempt to stop a machine by grabbing a belt. When replacing a belt, stop the machine and adjust it on the driver pulley first. When shifting overhead belts, always use a stick reaching nearly to the floor. If an overhead belt is caught and begins to wind around a shaft, get away. Shut off the power immediately. Metal belt fasteners must never be used on hand-shifted belts. In shifting lathe belts by hand, always use the palm with thumb and fingers extended. (2)

Caps

Caps or other types of head covering should be worn around machinery which presents a hair-catching hazard, and where there is danger of the hair catching fire. Caps with metal buttons or metal visors should not be worn around electrical hazards. Women working about machines should wear caps at all times. (1)

Checking Equipment

When accepting any equipment for use, examine it carefully and report any breaks or defects. (2)

Cleaning Up

Before students are permitted to clean up their machines, the main power switch should be thrown out and locked. (2)

* This material was taken from a doctoral dissertation at The Pennsylvania State College, 1934, by Paul L. Cressman; supervised by F. Theodore Struck.

These recommendations are the outcome of a two-year study made through the cooperation of the Pennsylvania State Department of Public Instruction and with the assistance of many school administrators, teachers and workers in the field of safety education. An analysis of 1,041 accident injury reports received from 153 school districts in Pennsylvania was supplemented by a critical study of related literature and by many conferences with people engaged in safety education.

The recommendations based on this exhaustive study include safety recommendations of general application as well as more specific suggestions for reducing accidents which result from conditions peculiar to each of the following: auto mechanics shops, machine shops, electrical shops and laboratories, foods laboratories, forges and foundries, print shops, sheet-metal shops and woodworking shops. Unfortunately, space requirements prevent us from reproducing the specific safety recommendations, and make it necessary to shorten the list of general recommendations by cutting out those dealing with hazards created by personalities rather than by equipment or working conditions.

The numbers throughout refer to the following pamphlets:

(1) Harrisburg: "Safe Practices—Recommendations." The Department of Labor and Industry, Commonwealth of Pennsylvania.
(2) Detroit: "Handbook of Safety Regulations." Board of Education, City of Detroit, 1933.
(3) Lancaster: "Safety Standards and Recommendations for School Shops." School District of Lancaster, Pa., 1934.
(4) Philadelphia: "Safety Standards and Recommendations for Use of Teachers of Shopwork." Philadelphia Public Schools, Philadelphia, 1930.
(5) Pittsburgh: "Safety Requirements for Shops." Pittsburgh Public Schools, Pittsburgh, 1933.

Crowding

Crowded conditions should be avoided. Crowding may be due to over-sized classes, lack of equipment, or to too limited floor area. Each student should have a *working* location. A minimum of at least 40 square feet per student is usually needed in the average shop.

Defective Machines and Tools

Avoid using broken, mushroomed or improperly tempered tools, splintered handles, improperly designed equipment, damaged or rotted ladders, worn or rotted rope, etc.

Dust

Dry sweeping should be permitted only where there is no dust hazard or where the nature of the work performed precludes the use of other methods; otherwise, all floors should be sprinkled with water before sweeping, preferably with water containing a disinfecting solution. Damp sawdust or other wetted materials may be used in lieu of water, especially around electric equipment where sprinkling water would tend to create a hazard. (1)

Extension Cords

Whenever possible, avoid using extension cords, by arranging for permanent electrical installations. (2)

Extension cords should be connected only to wall outlets, never to lighting circuits. Only super-service, heavy rubber-covered cord should be used. Separable connections should be provided on all extensions for drills, drop lights, etc. (2)

Falls

Avoid the use of defective ladders and ropes. Set ladders at proper angle with a sure footing. Guard-rails and foot-boards should be provided for elevated positions.

Falling Objects and Tools

Guard against possible causes of falling objects:

1. Objects falling from trucks, wagons and cars which are not properly blocked or tied. (3)
2. Tipping of hand trucks being moved on or off elevators. (3)
3. Transferring of objects by cranes, derricks or hoists. The proper selection of chains, rope sighs, hooks and other equipment is important. (3)
4. Jobs rolling to the floor from benches. Such jobs should be properly blocked. (3)
5. Using blocks, jacks and horses of insufficient strength. (3)
6. Throwing tools. They should be passed from hand to hand or placed in a suitable container which can be raised or lowered by rope. (3)
7. Leaving tools on the edge of high places where vibration or accidental striking may cause them to fall. (3) Tools should be carried in tool-belts or kept in tool-boxes when not in actual use. (1)
8. Piling of materials and tools.

The practice of working above unsheltered workmen should be actively discouraged at all times. (1)

During a lift everyone should keep out from under the object being lifted. (3)

Speeding Stock too Fast

Post feed and feed charts conspicuously and require the pupil to use only the speed or feed indicated for the job in hand. (3)

Footwear and Leggings

For normal shop wear shoes with unbroken soles and low or medium-height broad heels should be used. Where there is a possibility of heavy objects dropping on the feet, the toes should be boxed or reinforced. (1)

For hazardous occupations such as the handling of hot metal, acids, caustics, electric current and hot substances or other objects offering a burning or scalding hazard to the feet, specially adapted types of shoes are available and should be worn. (1)

Full-length leg or body protection should be used if the nature of the operation presents a full-length leg or body hazard. The method of fastening all protective leg covering should permit of instantaneous removal. (1)

Guards

Safeguards, safety appliances and other devices attached to machinery or guarding a hazardous condition should not be removed or rendered inoperative except for the purpose of immediately making repairs or adjustments. (1)

Goggles

Goggles or other forms of head and eye protection should be worn while working at grinders and shapers, welding, chipping, pouring metal and when lighting furnaces, even though the operation may take only a moment. (4 and 2)

Handling Stock

Splinters and metal cut accidents are due largely to sliding stock through hands or to failure to fasten stock securely while working on it.

Hasty Work

Haste should be avoided, and special warning safety precautions should be taken during the last month of each semester, when accidents are most numerous.

Hand Tools

Correct tools for each job should always be used, as per the following suggestions:

1. Machinist hammers should not be used as carpenters' hammers, and vice-versa. (3)
2. Screwdrivers should not be used as, or for, chisels. (3)
3. Wrenches should not be used for hammers. (3)
4. Pliers should not be used where a wrench is needed. (3)
5. Pliers, taped or untaped, should never be used on live electric circuits. (3)
6. Tongs or special holders should be used when holding bull chisels. (3)

Hand tools should always be kept in the best of condition as follows:

1. Mushroom heads on cold chisels and hammers should be dressed immediately. (3)
2. Hammers must have good handles and tight heads at all times. (3)
3. Pipe wrenches should always have sharp jaws. (3)
4. Handles which are cracked, slivered or splintered, or which have been excessively burned or worn, should be replaced at once with new or smooth handles. (3) and (1)
5. Screwdrivers and files should have well-kept handles. (3)

Handles

Wooden handles of hand tools should be of the best straight-grained material. (1)

Housekeeping

Placing of materials and tools: Do not store materials or tools on the floor or even leave them there temporarily to cause stumbling hazards; the same applies to placing them on unguarded overhead trestles or platforms from which they might fall. (2)

Removal of chips: Remove chips from machines with a brush or hook; do not use fingers, waste or cloth. (2)

Cleanliness and fire prevention: Rags, waste paper, bits of broken lumber, excelsior, packing materials and other inflammable débris should be cleaned up daily from under work-benches, from behind machines and from all other spaces. Such materials should be kept in approved self-closing metal receptacles. These containers should be kept safely clear of combustible surroundings and their contents be safely disposed of at least once each day. (2)

Illumination

Sufficient, non-glaring light should be furnished in all working areas, in stairways and storage places. Light should be placed particularly carefully at machines.

Keen-Edged or Pointed Tools

Direction of cut: In using adzes and draw-knives, no part of the body should be close enough to the point worked on to be endangered by a slip of the tool. In cutting with a hand knife, the direction of the cut should always be away from the body. (1)

Manner of carrying: Axes, hatchets, adzes, saws, knives, chisels, bits and similar tools should not be carried in a manner which endangers the bearer or persons passing him. A long screwdriver or other pointed tool should not be carried projecting from the pocket. (1)

Leaning on Machines

Do not lean on a machine while it is in operation. Keep at a safe distance from all moving parts. (2)

Loose and Inflammable Clothing

Superfluous material and loose-fitting clothing should be avoided in the presence of a hazard from moving machine parts. Sleeves should be rolled to the elbow, and loose ties arranged to prevent entanglement. (2) Excessively wide or long aprons should not be worn. They should never be tied on with wire, and should be but lightly secured, so that they can be easily torn loose by hand. (1)

In the presence of a spark or fire hazard, aprons of non-inflammable material should be used, and articles of wearing apparel composed principally of some form of cellulose (*i.e.*, spectacle rims, collars, eyeshades or cap visors) should not be worn. (1)

Machine Out of Order

Lock the switch or hang an "Out of order" sign on a machine that is out of order. (2)

Matches

Matches should be stored in closed glass, earthenware or metal containers and be in the personal charge of the teacher. Only safety type matches should be used. (2)

Obsolete Equipment

Equipment which cannot be brought up to present safety standards should be discarded. (3)

Operating and Safety Zones

Safety zones for the operator should be established around each machine. Painted lines on the floor prove satisfactory, especially if the paint used contains an emery grit. Corrugated rubber mats at the operator's position provide an added safety measure if fastened securely to the floor.

When a student is operating a machine, no other person but the instructor should be allowed inside the line. Except in case of emergencies, no one outside the line should be allowed to talk to the operator. The helper to a boy feeding a print press is the only exception to this rule. (2)

Piling Safely

Stability: Piling and removing objects from a pile should be done carefully to maintain the balance of the pile. (3) Whenever possible, the stability of piles should be increased by piling alternate layers crosswise or, in the case of long piles, by crisscrossing at the ends or using binder strips. (1) Round objects should be carefully blocked at the center and at both ends to prevent spreading. (1) Never pile or lean tools or materials against anything. (1)

Height and extent: Piles of material should not interfere with the adequate distribution of natural or artificial light (1) or with the operation of a sprinkler system. (1) Piles should not be placed so close to equipment as to hinder operators in the proper operation of their machines or expose them to hazard from slides or falls of material. (1) Material should not be piled to a height which would render the pile unstable. (1) Piles should not extend into travelways. (1)

Projecting Set Screws

Avoid the use of projecting set screw heads on revolving parts. (2)

Proper Footing

When working around any machine, be sure good footing is provided. (2)

Pouring Metals

Be sure that the mold is perfectly dry, to avoid spattering. Approved leggings, shoes and goggles should be worn by all persons who are exposed to the danger of burns from the spilling or splattering of molten metal. (2)

Sharp-Edged Scrap

Objects with sharp edges, such as scraps of glass, tin, sheet metal and the like, should not be thrown into ordinary waste containers, but should be placed in separate receptacles. Such material should not be permitted to remain on floors except during operations normally resulting in its creation. In the latter case, containers should be provided to catch such waste material as it drops from machines or benches, and the floors should be frequently cleaned up to prevent undue accumulation. (1)

Sharp Tools

Dull tools are dangerous. This is particularly true of dull circular saws. All shops should keep all tools sharp.

Slipping Hazards

Puddles or drippings of oil, grease, water or other liquids should be rendered harmless by mopping up and strewing sand or sawdust on the floor until the floor is dry. Oil-soaked sawdust should be disposed of promptly to prevent spontaneous ignition. Drippings on floors should be prevented by eliminating the cause or by placing pans in position until the cause has been eliminated.

Stand Clear

Form the habit of never standing in line with swiftly revolving parts such as grinding wheels, pulleys, saws and jointers. (2)

Starting Machines

Before throwing on the power, always examine the machine carefully to make sure every part is in working order. If possible, move the machine by hand to be sure all moving parts are free. (2)

Stop

Always stop a machine before cleaning, oiling, adjusting or setting cutting tools. (2)

Stock Held Insecurely

Stock should be fastened in the vise securely or clamped down.

Stock too Short

Avoid machining short stock, by establishing a minimum length for each shop. Twelve inches is a commonly accepted minimum length.

Storing Tools

No hand tools should be permitted to lie on the floor, ground or working platform when not in use for any length of time. They should be kept in the proper receptacles or storage places. (1)

Axes, hatchets, adzes and knives should be placed in receptacles provided for the purpose. For temporary purposes only, the cutting edge of the tool should be driven into a flat in places where persons will not trip over them or else lodged vertically in corners or racks where they timber far enough to hold the tool in an upright position. (1)

Striking Hand Tools

Wooden, soft metal, rawhide or rubber hammers or mallets should be used if the part receiving the blow

is case-hardened or tempered, or where inflammable or explosive gases or vapors are present. Sheets of brass or other soft metal may be used to receive blows, but should not be battered to an extent which would create a hazard of flying particles.

Hand striking tools which show any signs of cracking should be taken out of service immediately.

Brads or nails with rounded heads should not be driven with hammers and hatchets with corrugated driving faces for flat-headed nails. (1)

Teacher Present

Main switches in the shop should be pulled and the door on the panel box locked whenever the teacher leaves the shop. (4)

Travel Zones

Aisles should be established by painting clear white lines, and these aisles should be kept clear of any and all material and equipment. (3) No loose material of any description should be permitted to remain unsecured in any overhead position. (1)

Turning on Power

Instructors should personally see that the power switch on every machine is released before the main power supply is turned on. Instructors should always caution students to "stand clear" of machines when starting power machinery or throwing on electrical current. (2)

Unsafe Processes

Certain processes are known to be dangerous or risky, and these should be avoided.

Ventilation

Improper ventilation, fumes and suffocating gases must be eliminated, particularly in auto shops, foundries, etc.

Wrenches

Wrenches should properly fit the nuts, bolts or other objects which they are used to turn, and the use of thin pieces of material as shims to make oversize wrenches fit should not be permitted except where closed wrenches are used. (1)

Wrenches should be put on correctly to prevent spreading of the jaws and slipping. (1)

Adjustable wrenches should always be used with the jaws facing the direction of pull; this eliminates slippage, which results in skinned and mashed knuckles. (3)

EXPANDING THE SHOP FOR THE LARGER CLASS OF TODAY

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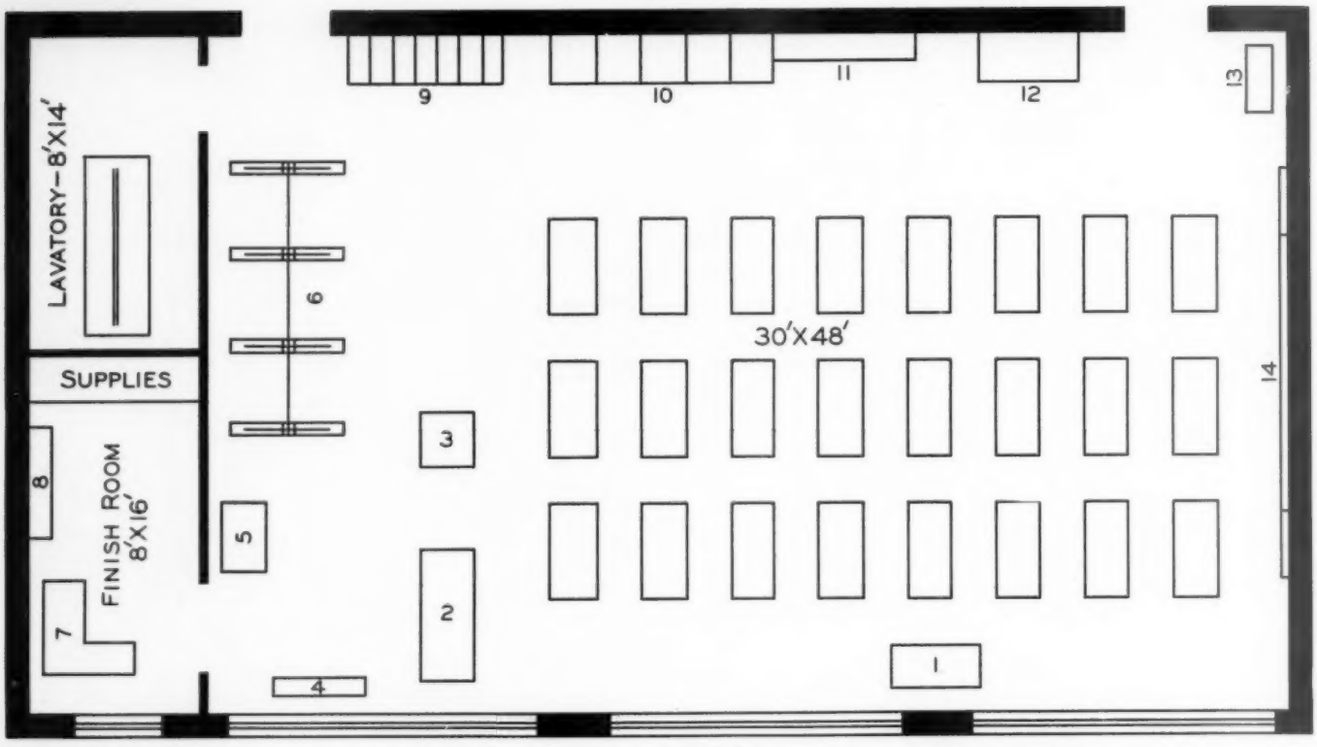
THERE has been a movement for some time by public school administrators to increase the size of classes in industrial arts and home economics to that in academic subjects. There are two major reasons for the move. First, and most important, is the difficulty of working out a schedule in each school where some teachers are teaching only one-half or two-thirds as many students as the academic teachers. Many school principals have become prejudiced against industrial arts because of this fact. Second is the increased per capita cost of small classes. The depression brought with it less revenue for the schools and an increased enrolment in the junior and senior high schools which has forced school administrators to do something drastic about the cost of education. Therefore, in many schools one way to reduce cost was to increase the size of classes in the field of industrial arts.

In the majority of instances money or space was not available for increasing the size of shops. This being true, the directors and teachers of industrial arts were confronted with the problem of replanning existing shops. Figure 1 shows the layout of a junior high school wood shop to care for 24 to 28 students.

Fig. 1



1. Grinder
2. Band Saw
3. Universal Saw
4. Clamp Rack
5. Glue Bench
6. Lumber Rack
7. Finish Table
8. Shelves
9. Short Lumber
10. Class Work Cabinets
11. Tool Cabinet
12. Drawing Equipment
13. Electrical Equipment—Supplies
14. Blackboard and Bulletin Board

There was adequate room in which to teach this number without crowding. In the summer of 1932 an edict was issued from the superintendent's office that all industrial arts teachers would be required to take as many students as the academic teachers. In addition, it was decided to teach mechanical drawing and electricity in the junior high school. This necessitated organizing the shops for three activities and an increased number of students, up to 40.

There were two factors to be considered: the rearrangement of equipment; and whether to teach all three subjects at the same time on a general shop basis or to teach each subject to all students at the same time. The director and teachers came to the conclusion that it would be more effective to teach all students one subject at a time; or, in other words, to set up a multiple-unit shop. The work-benches could be used for woodwork, electricity and, by attaching adjustable stools to the right leg of the work-benches, they could also be used effectively for drawing tables. The stools also provide a comfortable place for students to sit during discussion periods.

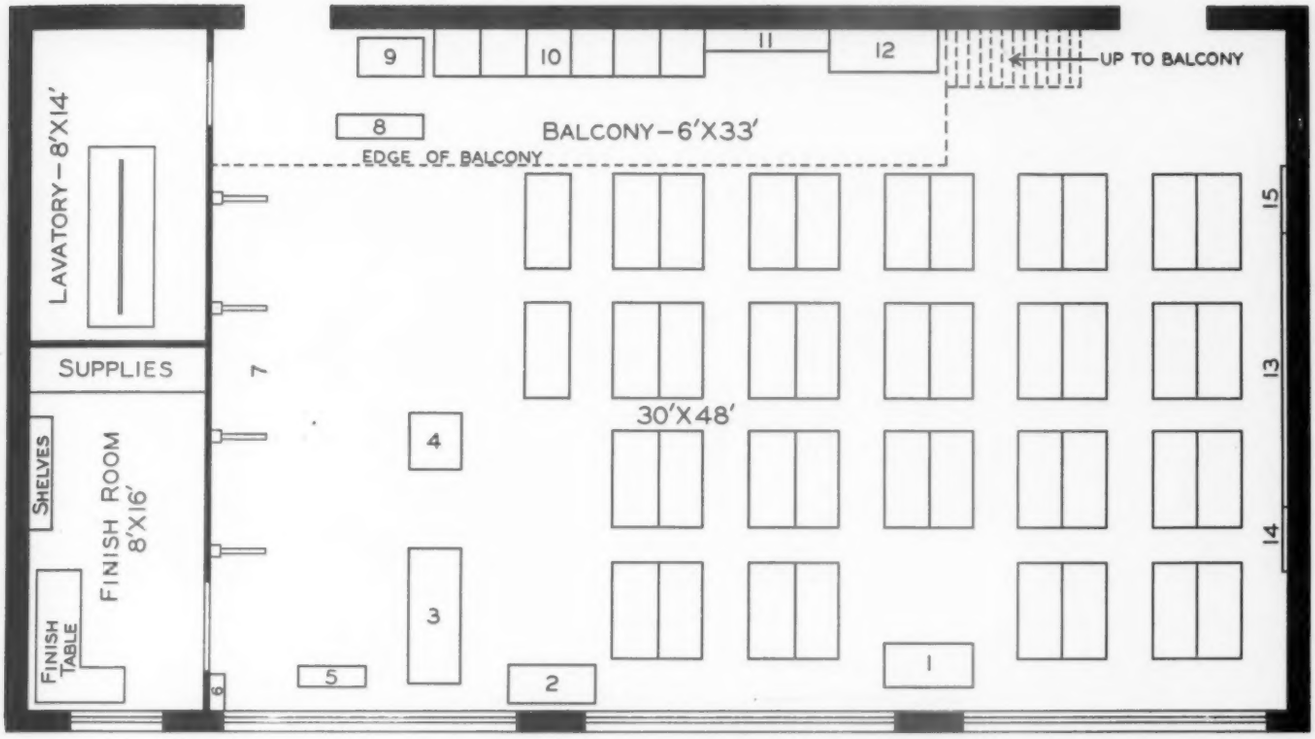
The rearrangement of the shop started by placing two benches back to back, thereby reducing the number of aisles and saving space. The second move was to change the construction of the lumber rack. The one in use was about 6 feet in height and quite wide. It was placed far enough away from the wall so that the lumber could be taken from both sides. A new rack was built of 4 x 4's the height of the room and bolted to the wall. Pieces of 1½-inch pipe 27 inches long, inserted 10 inches on center, were used to support the lumber. The new rack carries as much lumber as the old one and occupies less than half of the floor space.

With an increased number of students, there was the problem of caring for a larger number of unfinished assembled projects. With 6 periods a day and 40 students to the class, a total of 240 boys were to be provided for. To solve this problem, a balcony 6 feet wide was constructed on the inside wall of the shop, being supported on one side by the wall and on the outer side by rods dropped from the ceiling. By eliminating columns for supports, it gave more free floor space.

The balcony floor beams are 6 feet above the floor. This gives ample headroom on the main floor, and 5 feet 6 inches of headroom in the balcony. Very few junior high school students are over 5 feet 6 inches tall.

A balcony has three advantages: it adds more space to a shop at minimum cost; it provides a place where assembled projects may be stored with little danger of being marred by clamps or by being turned over;

Fig. 2



1. Grinder
2. Drawing Equipment
3. Band Saw
4. Universal Saw
5. Electrical Equipment
6. Patterns-Books
7. Lumber Rack
8. Clamps
9. Glue Bench
10. Class Work Cabinets
11. Tool Cabinet
12. Short Length Stock
13. Blackboard
14. Bulletin Board
15. Bulletin Board

and it makes it possible for the janitor to keep the main floor clean at all times. A clean, orderly shop is the result. One end of the balcony may be used for finishing if needed.

For electrical experiments, a circuit was constructed over each row of benches and fastened to the ceiling. Wires were dropped to each set of benches. A transformer, fastened to the wall and connected to the circuits, reduced the voltage for experimental work, thereby doing away with the need of dry cells with a saving of some storage space. Boards 20 x 24 inches are used by the students for the unit in wiring. These boards can be taken to the benches, and they require little space for storage when not in use. A table saw has been added to the equipment since the reorganization. With the new saw and the extra benches, and with the addition of new activities, the room is not crowded beyond effective work. The past four years an average of 40 students has been cared for each period in the school day. The same man is teaching now who was teaching when smaller classes were permitted, and he finds that good work can be accomplished with large classes when the shop is well organized and there is adequate equipment.

Figure 2 shows the present layout of the same shop.

In addition to the school's providing more space and equipment, it has been necessary for the teacher to do other things. The large classes require a personnel organization of the students to assist the teacher in caring for the tools and supplies. A superintendent and foremen in each class are appointed for this service.

Better organization of instructional materials is demanded, whereby the teacher has the aid of instruction sheets to assist him in his work. The better students are able to interpret the written material, which gives the teacher more time to assist the poorer ones.

EQUIPMENT FOR SHEET METAL WORKING

Check Lists of Equipment for Instruction on Three Levels

NO. 1—EQUIPMENT FOR VOCATIONAL OR TECHNICAL HIGH SCHOOLS

Machines

1 36″ Squaring shear
1 30″ Adjustable bar folder
1 36″ Combination brake and folder for bench use
1 30″ Wrights pipe folder
1 36″ x 2″ Slip roll forming machine
1 30″ Rapid grooving machine
1 Ring and circle shear, 3″ to 24″
1 Lever slitting shear with rod cutter, 10 gauge
1 15″ Throat lever punch with ⅛″, 3/16″, and ¼″ punches and dies
*1 Turning machine with 2″ turning rolls
*1 Burring machine with 2″ burring rolls
*1 Wiring machine with 2″ wiring rolls
*1 Elbow edging machine with 2″ edging rolls
*1 Setting down machine, 24 gauge
*1 15½″ Throat double seaming machine
*1 Beading machine, 7″ throat
*1 Combination crimping and beading machine—20 gauge
1 30″ Adjustable gutter beader with ½″ bead rod
1 Brace and wire bender—cap ¼″ x 2″ band iron
2 Revolving machine standard with 10 machine holders

Stakes and Bench Hand Tools—(Order quantities specified for complete shop)

1 40″ Hollow mandrel stake
1 30″ Solid mandrel stake
1 Double seaming stake with 4 heads
1 Double seaming stake
1 Beakhorn stake 14″ x 19″
1 Hatchet stake 11″
1 Common blowhorn stake
1 Needle case stake
1 Candle mould stake
1 Creasing stake with horn
1 Conductor stake
1 Round head stake
1 Bottom stake
1 Coppersmith square stake
1 Common square stake 2¾″ x 4½″
1 Bevel edge square stake 2¼″ x 4½″
4 30″ x 8″ Stake bench plates
1 Handy crimper
1 Hand punch with ⅛″, 3/16″, ¼″ P. & D.
1 8-ft. Steel straight edge—2½″ x 5/16″
1 Jumbo hand seamer—6⅞″ blade
3 Baby hand seamers—3½″ blade
3 24″ x 16″ Steel squares
1 Compound lever bench shear
1 2½″ Cut, bull dog snip
1 Scroll snip
1 Hawks bill snip
1 3½″ Cut, straight blade snip
1 3″ Cut, curved blade snip
1 3½″ Cut, combination snip
1 58 oz. Raising hammer
1 32 oz. Raising hammer
1 16 oz. Riveting hammer
1 16 oz. Setting hammer
1 16 oz. Ball pein hammer
2 Sets cold chisels
(2 ea. ¼, 5/16, ⅜, ½, ⅝ and ¾ in.)
2 Sets rivet sets
(2 ea. 0, 1, 2, 3, 4, 5, 6, 7, 8)
2 Sets hollow punches
(2 ea. ⅜, ½, ⅝, ¾, ⅞, 1, 1¼, 1½, 1¾ in.)
2 Sets solid punches
(2 ea. 0, 1, 2, 3, 4, 5, 6, 7, 8)
2 Sets hand groovers
(2 ea. 0, 1, 2, 3, 4, 5, 6)
8 Double burner brick lined gas furnaces
1 pr. 3 lb. per pr. soldering coppers with handles
1 pr. 4 lb. per pr. soldering coppers with handles
1 8″ Adjustable angle wrench
1 12″ Knife handle monkey wrench
1 12″ Pipe wrench
1 8″ Gas burner plier
4 6″ Round nose pliers
4 6″ Flat nose pliers
1 12″ End cutting nipper
1 4″ Solbar screw driver
1 8″ Solbar screw driver
2 8″ Side cutting pliers

Individual Hand Tools—(Order one set for each student)

1 3″ Cut, straight blade snip
1 14 oz. Riveting hammer
1 14 oz. Setting hammer
1 Scratch awl
1 8″ Wing divider
1 Prick punch
1 5¼″ x 2⅜″ Hickory mallet
1 2 lb. Soldering copper (1 lb. each)
1 12″ x 8″ Steel square
1 Plumbers' scraper

NO. 2—EQUIPMENT FOR SENIOR OR JUNIOR HIGH SCHOOLS

Machines

1 30″ Squaring shear
1 36″ Combination brake and folder for bench use
1 30″ x 2″ Slip roll forming machine
1 30″ Rapid grooving machine
1 Ring and circle shear 3″ to 24″
1 Beading machine with ¼″ single bead and ¾″ Ogee bead rolls and bench standard 7″ throat
1 15½″ Throat double seaming machine and bench standard
*1 Combination crimper and beader—24 gauge
*1 Turning machine with 2″ rolls
*1 Burring machine with 2″ rolls
*1 Wiring machine with 2″ rolls
1 pr. Elbow edging rolls for above with 2″ rolls
1 Setting down machine and bench standard—24 gauge
1 Revolving machine standard with 10 machine holders

Stakes and Bench Hand Tools

1 40″ Hollow mandrel stake
1 Double seaming stake with 4 heads
1 Beakhorn stake 14″ x 19″
1 Hatchet stake 11″
1 Common blowhorn stake
1 Conductor stake
1 Round head stake
1 Bottom stake
1 Coppersmith square stake
1 Bevel edge square stake 2¼″ x 4½″
2 30″ x 8″ Stake bench plates
1 Hand punch with ⅛″, 3/16″, ¼″ P. & D.
1 4-ft. Steel straight edge—2½″ x 5/16″
3 Baby handy seamers—3½″ blade
3 24″ x 16″ Steel squares
1 Compound lever bench shear
1 2½″ Cut, Bull dog snip
1 Scroll snip
1 Hawks bill snip
1 3½″ Cut, straight blade snip
1 3″ Cut, curved blade snip
1 3½″ Cut, comb. snip
1 32 oz. Raising hammer
1 16 oz. Riveting hammer
1 16 oz. Setting hammer
1 Set cold chisels
(1 ea. ¼, 5/16, ⅜, ½, ⅝ and ¾ in.)
1 Set rivet sets
(1 ea. 0, 1, 2, 3, 4, 5, 6, 7)
1 Set hollow punches
(1 ea. ⅜, ½, ⅝, ¾, ⅞, 1, 1¼, 1½, 1¾ in.)
1 Set solid punches
(1 ea. 0, 1, 2, 3, 4, 5, 6, 7, 8)
1 Set hand groovers
(1 ea. 0, 1, 2, 3, 4, 5, 6)
4 Double burner brick lined gas furnaces
1 pr. 3 lb. per pr. Soldering coppers with handles
1 pr. 4 lb. per pr. Soldering coppers with handles
1 8″ Adjustable angle wrench
1 12″ Knife handle monkey wrench
1 12″ Pipe wrench
1 8″ Gas burner plier
2 6″ Round nose pliers
2 6″ Flat nose pliers
1 4″ Solbar screw driver
1 8″ Solbar screw driver
2 8″ Side cutting pliers

Individual Hand Tools—(Order one set for each student as specified on No. 1 Recommendations)

NO. 3—EQUIPMENT FOR COMPOSITE SCHOOL SHOPS

Machines

1 30″ Squaring shear
1 30″ Adjustable bar folder
1 30″ x 2″ Slip roll forming machine
1 Combination bench machine with 2″ diam. turning rolls, burring rolls, wiring rolls and bench standard
1 pr. No. 1 Elbow edging rolls for comb. machine
1 Beading machine with ¼″ single and ¾″ Ogee rolls, with bench standard, with 7″ throat
1 Combination crimping and beading machine, with bench standard—24 gauge
1 Setting down machine with bench standard—24 gauge
1 15½″ Throat double seaming machine with bench standard

Stakes and Bench Hand Tools

1 Universal stake holder and stakes (beakhorn, blowhorn, creasing with horn, double seaming, conductor, candle mould and needle case)
1 40″ Hollow mandrel stake
1 Coppersmith square stake
1 Hatchet stake 11″
1 Revolving bench plate
1 Hand punch with ⅛″, 3/16″, ¼″ P. & D.
1 4-ft. Steel straight edge 2¼″ x 5/16″
2 Baby hand seamers—3½″ blade
1 24″ x 16″ Steel square
1 2½″ Cut, bull dog snip
1 Scroll snip
1 3½″ Cut, straight snip
1 3″ Cut, curved blade snip
1 3½″ Cut, comb. snip
1 32 oz. Raising hammer
1 16 oz. Riveting hammer
1 16 oz. Setting hammer
1 Set cold chisels
(1 ea. ¼, 5/16, ⅜, ½, ⅝ and ¾ in.)
1 Set rivet sets
(1 ea. 2, 3, 4, 5, 6, 7)
1 Set solid punches
(1 ea. 3, 4, 5, 6, 7)
1 Set hand groovers
(1 ea. 1, 2, 3, 4, 5, 6)
2 Double burner brick lined gas furnaces
1 pr. 3 lb. per pr. Forged soldering coppers with handles
1 6″ Round nose plier
1 6″ Flat nose plier
1 12″ Knife handle monkey wrench
1 8″ Side cutting plier

Individual Hand Tools—(Order one set for each student as specified on No. 1 Recommendations)

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THE AHI ALTERNATING-CURRENT GENERATOR AND MOTOR

The Type AHI alternating-current generator here illustrated has long been the standard for teaching the fundamentals of alternating currents. Its flexibility permits its use in a very wide variety of laboratory experiments. It is now manufactured in two ratings which conform closely to standard commercial machines, but modifications make it ideal as a demonstrating unit for school use. The Type AHI machine is designed to run as an alternator or synchronous motor. Extra rotors are available which, when substituted in place of the salient pole rotor, convert the machine into a squirrel-cage induction motor, a phase-wound-rotor induction motor or frequency converter.

A phase displacement set and a phase displacement dynamometer set have been developed around the rating shown on this page. These are two unit sets designed specially for laboratory use.

Motion pictures and illustrated lectures, loaned without charge (except cost of transportation) to schools, colleges and engineering societies. All film subjects obtainable in either the 35-mm. or 16-mm. standard widths, except those with synchronized sound, which are in 35-mm. film only.

The following **equipment for use in motion picture presentation** is furnished by General Electric Company: transformers, circuit breakers, wire and cable, wiring devices, panel boards and switchboards, meters and instruments, fuses, switches, relays, resistors, rectifiers, motor-generator sets,

battery-charging equipment, motors and control, floodlights, searchlights, arc lamps, mercury-vapor lamps, lamps for photography and projection, stage and theater lighting, thyratron-reactor dimming control, master-control boards; selsyns for remote control of spotlights, floodlights, shutters and color screens; sign-lighting equipment; sequence-circuit control dimmers, photoelectric relays for lighting control, air-conditioning equipment, ticket booth machines, etc.

See Booklet GES-402 for lists of motion pictures, silent films and illustrated lectures furnished by General Electric Company. Subjects include: Street Lighting, Floodlighting, A Brief History of the Electrical Industry, Charles P. Steinmetz, Within the Gates of General Electric, Thomas A. Edison, History of Floodlighting, History of the General Electric Company, The All-Electric Ship, The Vacuum Tube in a Wider Field, Heat, Magnetism, Mechanics, and Sound.

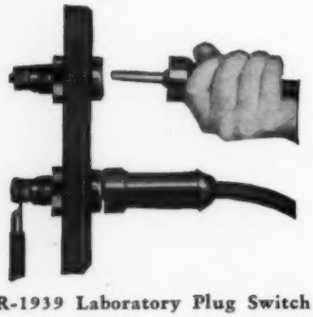
AVAILABLE ON REQUEST

Bulletin GEA-1185B, illustrating and describing G-E apparatus particularly adapted to school and college laboratories.

Instruction booklets on shop projects, as follows:

1. Bulletin GES-909: Construction Data for a ¼-hp. Single Phase Induction Motor
2. Bulletin GEA-2138: Construction Data for a ¾-hp. Three-Phase Induction Motor
3. Bulletin GEA-2140: Construction Data for a ½-hp. Single Phase Induction Motor
4. Bulletin GEA-2289: Construction Data for a 250 Watt 125 V. d-c Generator
5. Bulletin GET-569: Construction Data for a Transformer Rated Natural Draft, 60 Cycles, 1½ kv-a; Primary Volts, 220; Secondary Volts, 55/110

(Kits for these projects can be purchased from General Electric Company.)



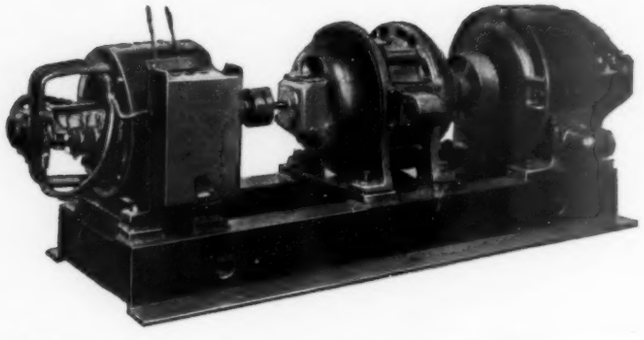
CR-1939 Laboratory Plug Switch

SWITCHBOARDS FOR LABORATORY SERVICE

General Electric has developed a switchboard to meet the needs of the average technical school laboratory which provides maximum flexibility. This board provides for parallel operation of a-c and d-c generators, under standard conditions, and it supplies the laboratory with a very effective and variable feeder system. A great asset to this feeder system is the plug switch shown at left used extensively throughout the board. It facilitates making and changing connections and saves time and trouble in shifting power to circuits where needed.

Science Laboratory Distribution Panel, 125 V. and 16 V. d-c—115 V. and 230 V. a-c

Standard Control Apparatus to protect students from accidental contact from live switches; **Dynamometers,** for accurate measurement of power or torque; **Transformers; Synchronous Converters; Sine-Wave Generators; G-E Steam Turbines; Air Circuit Breakers,** for protection of laboratory apparatus from abnormal current conditions; **High-Voltage Testing Equipment;** and **Generator Voltage Regulators,** are among the other types of school laboratory equipment described and illustrated in **Booklet GEA-1185.**



Science Laboratory d-c Motor Generator Set—Induction motor drive—generates 125 V. d-c and 16 V. d-c

ELECTRICAL MEASURING INSTRUMENTS

No apparatus in the college laboratory is of more importance than the electrical measuring instruments. A well-equipped laboratory will need an assortment of standard instruments of all types and capacities, since there is hardly an experiment performed by the students which does not require their use. When selecting such instruments, too much care cannot be given to accuracy, permanence of calibration, dead-beat indications, and legibility of scales. In the design and construction of G-E electrical measuring instruments, careful consideration is given to all of these details.

Portable Wattmeter, Type P-3

PORTABLE WATTMETER, TYPE P-3

Type P-3 portable instruments as illustrated have been designed for high accuracy under extraordinary conditions of service. They comprise a full line of ammeters, voltmeters, single-phase and polyphase wattmeters, frequency meters, power-factor meters, and single-phase wattmeters for low-power-factor measurements — each covering the usual ranges of current, voltage, frequency, etc. The accuracy is 0.2% of full scale value. The size is 5⅝ x 8⅝ x 8¼ inches.

OSCILLOGRAPH, TYPE PM-12

Portable Oscillograph, Type PM-12

The PM-12 is a compact portable two-element oscillograph for visual inspection or for photographic recording of wave shapes. The size is 18½ x 10 x 9 inches. A calibrating screen is provided so that current and voltage values can be obtained quickly and easily. It is self-contained and operates from a commercial lighting source.

PORTABLE A-C VOLTMETER, TYPE AP-9

Portable a-c Voltmeter, Type AP-9

The AP-9 is a medium-size portable a-c instrument for measurements of current, voltage or watts. Its size is only 2 7/16 x 6 9/16 x 4 13/16, and the scale length 4.1 inches. The accuracy is 0.75% of full scale value. A molded textolite case with hinged cover completely protects the glass and binding posts when not in use. This instrument has been designed and built for long dependable service under severe conditions.

Other electrical measuring instruments for college laboratory use which are described and illustrated in Booklet GEA-1185B (approximately 60 pages) are portable voltmeters, portable timing devices, synchronism indicators, power-factor meters, strip-chart recording instruments, watthour meters, and permanent-magnet and cathode-ray oscillographs.

VACUUM TUBES

The importance of vacuum tubes nowadays need hardly be mentioned to the technical educator. It may be said that they are revolutionizing the Electrical Industry.

All types of vacuum tubes are available. Typical of the all metal type is the FG-166 Phanotron rectifier shown. This tube is a half wave rectifier rated at 1500 volts and 30 amperes.

Phanotron Tube FG-166

Further information will be gladly furnished by the Educational Specialist at the nearest office of the General Electric Company or Schenectady, New York.

AMERICAN TYPE FOUNDERS

DEPARTMENT OF EDUCATION

200 ELMORA AVE., ELIZABETH, N. J.

TEACH PRINTING

AN IDEAL COURSE OF STUDY FOR SCHOOLS AND COLLEGES

The school printing shop presents many advantages to both the students and the faculty. By providing a publicity medium under school control, it is of great assistance to school executives in interpreting their aims and problems to the community; in "selling" their educational program to parents and officials.

As a course of study, printing ranks high since it brings the student into contact with many fields of thought and action related to school work—history, geography, English grammar, syntax and punctuation, mathematics and art. It creates artistic appreciation by developing a feeling for beauty of line and form; a sense of balance and proportion. It encourages the formation of good habits—accuracy, perseverance and orderliness—and teaches the value of cooperative effort. Its variety of operations offers plenty of room for the development of individual talents and a high degree of manual skill.

"Learn by Printing" is the application of the "Learn by Doing" philosophy. Educators who have tried school printing courses recommend them highly for their cultural and practical value.

PERFECTION *Senior High School Printing Unit*

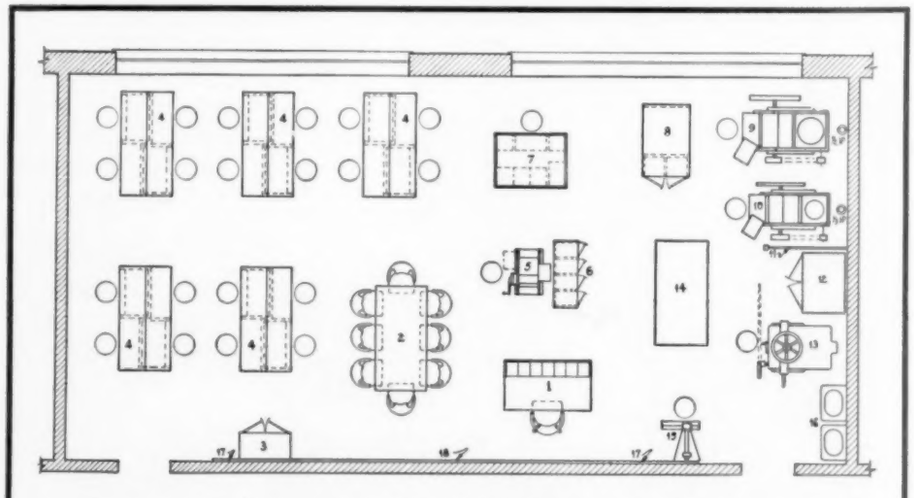
ACCOMMODATES 20 TO 25 STUDENTS

The PERFECTION Senior High School Printing Unit is a complete printing plant designed especially for Senior High School work. This well-balanced unit provides facilities for turning out a wide variety of high quality work and a compact orderly arrangement ideally suited to the instructor's needs. The unit includes only equipment of the highest quality of materials and workmanship.

The machinery is simple in design, easily operated and provided with all the necessary safety features. Type cabinets are substantial and accessible and have no superstructure to obscure the instructor's view of the class. Type faces are well chosen to provide attractive combinations for many types of work. A practical floor plan for the PERFECTION Unit is shown below.

Key to Floor Plan

1—Instructor's Desk
2—Study and Reference Table
3—Bookcase
4—No. 870 American School Type Cabinet
5—No. 1 Vandercook Proof Press
6—No. 13535 American School Galley Cabinet
7—No. 13983 American School Imposing Table
8—No. 9095 American School Pressroom Cabinet
9—12x18 C. & P. Press
10—10x15 C. & P. Press
11—Guard Rail
12—Paper Storage Cabinet
13—Lever Paper Cutter
14—Bindery Table
15—Boston Wire Stitcher
16—Lavatories
17—Cork Exhibit Board
18—Blackboard
◎—Power Intake
○—Position of Student



FLOOR PLAN OF PERFECTION PRINTING UNIT

A LIST *OF EQUIPMENT AND TYPES CONTAINED IN THE PERFECTION SENIOR HIGH SCHOOL PRINTING UNIT*

MACHINERY

1 8x12 New Series C. & P. Platen Press, complete with 3 rollers
2 prs. Roller Supporters
1 Model D Redington Counter
1 C. & P. Platen Guard
1 C. & P. Press Brake
1 New Series Short Fountain
1 Motor Bracket with belt-tightening adjustment including pulley
1 Kimble ⅓ h. p. Motor, variable speed, with pedestal speed control, belt drive for local current
1 Endless Leather Belt
1 Wire Mesh Belt Guard
1 Drip Pan, galvanized iron, 4x5 feet, beaded edge
1 12x18 New Series C. & P. Platen Press, complete with 3 rollers
2 prs. Roller Supporters
1 Vandercook Proof Press
1 Model D Redington Counter
1 C. & P. Fibre Flywheel Guard
1 C. & P. Platen Guard
1 C. & P. Press Brake
1 C. & P. Long Fountain
1 Motor Bracket with belt-tightening adjustment including pulley
1 Kimble ½ h. p. Motor, variable speed, with pedestal speed control, belt drive, for local current
1 Endless Leather Belt
1 Wire Mesh Belt Guard
1 Drip Pan, galvanized iron, 4x5 feet, beaded edge
1 26½-inch Hand Lever Paper Cutter, C. & P. Craftsman or Challenge Advance, including 2 knives, measuring tape and 4 cutting sticks, and equipped with two-handed safety control
1 No. 5 Boston Wire Stitcher, foot power

TYPE *AND SPACING MATERIALS*

Schoolbook Oldstyle

1 font	6 point	20 lbs.	18 point
40 lbs.	8 point	2 fonts	24 point
200 lbs.	10 point	1 font	30 point
30 lbs.	12 point	1 font	36 point
15 lbs.	14 point		

Century Schoolbook Italic

1 font	6 point	1 font	14 point
1 font	8 point	1 font	18 point
1 font	10 point	1 font	24 point
1 font	12 point		

Century Schoolbook Bold

1 font	6 point	1 font	18 point
1 font	8 point	1 font	24 point
1 font	10 point	1 font	30 point
1 font	12 point	1 font	36 point
1 font	14 point	1 font	48 point

HEAVY COPPERPLATE GOTHIC

1 font	6 point No. 21	1 font	12 point No. 26
1 font	6 point No. 22	1 font	12 point No. 27
1 font	6 point No. 23	1 font	12 point No. 28
1 font	6 point No. 24	1 font	18 point No. 29
1 font	12 point No. 25	1 font	18 point No. 30

Wedding Text

1 font	8 point	1 font	14 point
1 font	10 point	1 font	18 point
1 font	12 point	1 font	24 point

SPACES AND QUADS

5 lbs.	6 point	10 lbs.	18 point
15 lbs.	8 point	10 lbs.	24 point
60 lbs.	10 point	5 lbs.	30 point
20 lbs.	12 point	5 lbs.	36 point
10 lbs.	14 point	1 font	48 point

5 fonts No. 9011D 2 point Leads, 5 to 9½ picas
5 fonts No. 9011E 6 point Slugs, 5 to 9½ picas
10 fonts No. 9011F 2 point Leads, 10 to 40 picas
10 fonts No. 9011G 6 point Slugs, 10 to 50 picas
5 lbs. No. 1002 2pt. L. S. Brass Rule
5 lbs. No. 2082 2pt. L. S. Brass Rule
1 font No. 1002 2 point Miters for Rule
1 font No. 2082 2 point Miters for Rule
25 lbs. Metal Furniture, L. S. font
5 lbs. American Line Leaders, 10 point, Series 546, 4 dots to the em
1 lb. 10 point Braces and Dashes
1 lb. 10 point Fractions
½ lb. 10 point Reference Marks
1 font Series 21 Parentheses and Brackets
1 No. 20 Assortment Thin Spaces with Quarter Size Case

FURNITURE

5 No. 870 American Perfection School Type Cabinets, steel construction, with cases
1 No. 13983 American School Imposing Table, steel construction, including reglet and furniture
1 No. 13535 American School Galley Cabinet, steel construction, with capacity for 100 galleys
1 No. 529 American School Pressroom Cabinet, steel construction
1 No. 15038 Bindery Table, size 36x72 inches
1 No. 15050 Padding Attachment
1 No. 15047 Stock Forwarding Table
2 No. 3045 Quarter Size Rule Cases
1 No. 3185 Leader Box

MISCELLANEOUS

20 Rouse Pica Composing Sticks, 6x2, stainless steel
1 Rouse Job Composing Stick, 10x2, stainless steel
1 Rouse Job Composing Stick, 15x2, stainless steel
100 Pressed Steel Galleys, 8¾x13 inches
2 All Brass Job Galleys, 8¾x13 inches
1 All Brass Job Galleys, 12x18 in.
1 Success Benzine Can, quart size
1 Justrite Benzine Storage Can, gallon size
1 Stapleset Benzine Brush No. 1, oval back
1 No. 5805 Hickory Mallet
1 No. 5839 Type Planer, 3¾x6 in.
1 No. 5835 Proof Planer, 3½x8 inches, with leather top
1 doz. Challenge Quoins No. 1
1 Challenge Quoin Key No. 1
1 doz. Megill Spring Tongue Gage Pins
1 doz. Megill No. 2 Original Steel Gage Pins
1 Boston Model No 1. Typographic Numbering Machine, 5 wheels
1 Line Gage, Rouse No. 2, pica and nonpareil, 12 inch
1 Oily Waste Can, NcNutt No. 3
1 lb. Amtyco Printing Ink in ¼ lb. tubes, assorted colors
10 lbs. No. 25 Bookbinders' Wire on 2 steel spools
1 ball Page Cord
1 set of "Visual Aids for Instruction in Printing," 24 charts 11-x14 inches
1 copy "The Practice of Printing," by Polk
1 copy "Student's History of Printing," by Haines
1 No. 1 Universal Cylinder Bellows
1 No. 604 Style B Square End Ink Knife
1 No. 30 American Lead and Rule Cutter
1 quart Make-Ready Paste
1 quart Tabbing Compound

Types used: Bernhard Gothic Medium and Italic and Stymie Black

AMERICAN TYPE FOUNDERS

EVERYTHING FOR THE SCHOOL PRINTSHOP

TYPE CABINETS

A VARIETY OF MODELS TO MEET EVERY SCHOOL PRINTSHOP NEED

COMBINATION PRESSROOM CABINET AND STOCK TABLE

For drying sheets and storing inking rollers and materials. A compact and efficient cabinet that saves space and steps. Stock table contains drying rack with 12 drying frames accessible from both sides, ink and roller compartments, a bin for rags and drawers for tools.

TRADE CLASS TYPE CABINET

A sturdily constructed steel cabinet. Plenty of room for liberal supply of spacing materials provided by the double depth lead and slug rack on top. Double work bank top provides a full length working surface for the use of 8⅜x13 galleys. Contains two tiers of 24 full size, standard depth California job cases with combination pulls and label holders. Finished in olive green baked enamel with black enamel top. No. 12008.

PERFECTION SCHOOL TYPE CABINET

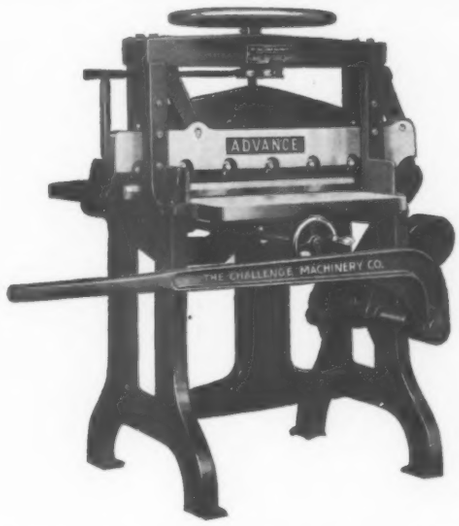
A hardwood cabinet accommodating four students. Steel double work bank top with handy lead and slug rack under each working edge. No superstructure to obscure the instructor's view of the class. Contains 26 California job cases, two blank cases and four Wells Font cases. Sanitary raised base makes sweeping easy. Flat varnish finish. No. 9192.

AMERICAN IDEAL SCHOOL TYPE CABINET

A substantial hardwood cabinet accommodating two students. Contains one No. 2701 blank case, thirteen No. 2735 California job cases, and two No. 2765 Wells Font cases, all full size. Sanitary raised base. Flat varnish finish. No. 9190.

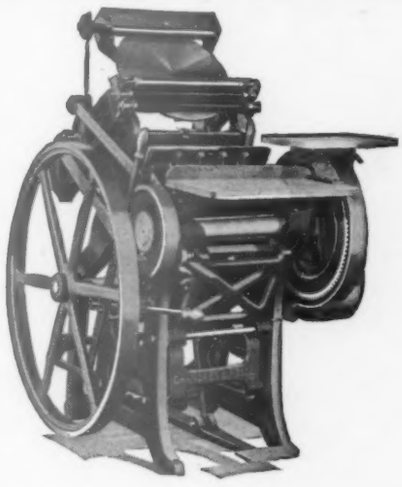
PRINTSHOP MACHINERY

ACCURATE, UP-TO-DATE EQUIPMENT DESIGNED FOR SCHOOL USE



ADVANCE LEVER PAPER CUTTER

A strong, accurate and economical cutter. Planned to give the greatest power on cutting lever without back-breaking effort. Duplex measuring tape with easy-to-read indicator permits measuring odd multiples of ⅓, ⅙ ,½ inch, etc. Four sizes 19, 26½, 30 and 36 inches.



CHANDLER & PRICE NEW SERIES PRESS

A safe, simply operated press that will turn out unusually high quality work. Standard equipment: Single disc throw-off, depressible grippers, 3 semi-steel chases, 6 roller stocks, 6 roller trucks, 2 wrenches, crankshaft and combined gear and pinion guard. Chase sizes, 8x12, 10x15 and 12x18 inches.

VANDERCOOK PROOF PRESS

Ideal for all hand inking work within its size. Positive, even impression either large or small forms. Strongly constructed and easily operated. Accurate, rigid and accessible. Printing surface 14x18 inches. No. 1.

BOSTON WIRE STITCHER

For both saddle stitching and side stitching work. Capacity ranges from two sheets to ½ inch; four cutting surfaces; singly adjusted to thickness of work by using hand lever. No. 5.

ATF CARRIES A COMPLETE LINE OF EQUIPMENT AND SUPPLIES FOR EVERY PRINTSHOP • FOR EVERY BUDGET

For more than forty years ATF, manufacturer of foundry type and Kelly Presses, has been America's leading supplier of printing equipment. More than 4000 items comprising every need of the modern printshop are regularly carried in stock. ATF maintains a staff of expert printing consultants, experienced in school problems who will be glad to discuss your individual problems with you and offer you their advice. Write to the American Type Founders, Department of Education, 200 Elmora Avenue, Elizabeth, New Jersey. A complete catalog of school printing equipment will be sent on request.

WALKER-TURNER CO., INC.

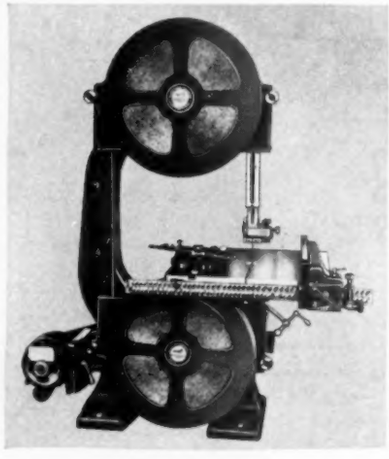
639 South Ave. Plainfield, New Jersey

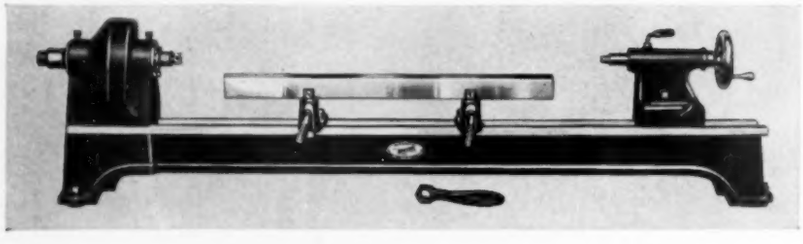
SERIES 900 16″ BAND SAW

Cuts true, without vibration. Rugged. Completely guarded for full protection of the operator. These features, plus its powerful, graceful lines, have earned for this band saw the approval of every shop instructor who has seen it. 12″ cutting capacity, 16″ throat. Heavy one piece frame, SKF ball bearings, many other advantages that put it in a class by itself. Two smaller models also built by Walker-Turner.

SERIES 900 BELT AND DISC UNIVERSAL SURFACER

A full production tool that does belt and disc sanding, plus "stroke" surfacing of any length panels up to 30″ wide. Surfaces wood, metal, plastics, fibre, other materials with ease and speed. 4 SKF dust-sealed ball bearings, efficient dust collecting system, four speeds, scores of other important features. Smaller model available.



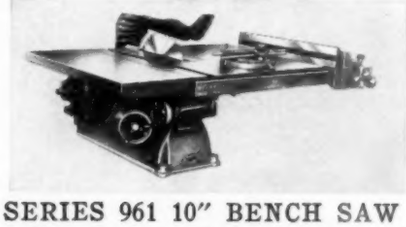


SERIES 900 WOOD TURNING LATHE

Designed to meet the exacting requirements of commercial pattern makers and advanced craftsmen. Massive construction, unusual precision and high quality features are evident in every detail of this lathe. The hollow head spindle (⅝″ inside dia.) permits turning of long stock. Morse Taper centers. SKF ball bearings. 37″ between centers, 10″ swing. Heavy construction permits this lathe to do accurate metal turning, with only the addition of the compound tool rest. Four other Driver Lathes of smaller capacity available.

SERIES 941 8″ BENCH SAW

This new Walker-Turner tool combines the latest triumphs of Walker-Turner engineers in features for safety, performance and easy operation. New "kick-back pawls" prevent stock being thrown back by blade. Powerful table tilting and arbor raising devices. Real safety guard and splitter, ripping fence of correct length. Big table, with plenty of room in front of blade. 2¼″ cutting capacity.



SERIES 961 10″ BENCH SAW

This is the tool that has proved the favorite in school shops. Full 3″ cutting capacity. SKF ball bearings. Geared self-indexing mitre gauge. Two smaller Walker-Turner Bench Saws available.

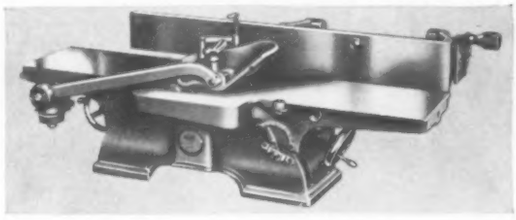
PR102 HEAVY DUTY FLEXIBLE SHAFT

This powerful flexible shaft outfit will handle sanding, grinding, drilling, cleaning, buffing, and polishing. Shaft is 5′ 4½″ long, rubber covered, with SKF ball bearing hand piece. Smaller models available.

WALKER–TURNER

WALKER-TURNER ENGINEERING MEETS ALL THREE SCHOOL SHOP DEMANDS!

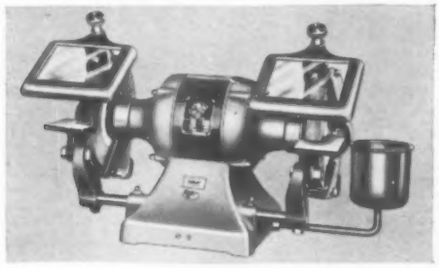
Versatility, ruggedness, and safe, easy operation were the primary considerations in the design and construction of these Walker-Turner Tools for the school shop. Study the catalog, or see them at your dealer's, and you'll agree nothing has been overlooked to make these sturdy tools the best that money can buy—and at the same time, keep their cost within the reach of the typical school shop budget.



SERIES 900 PRECISION 6″ JOINTER

Dual purpose guard provides real safety, also permits stock to be held against cutter and planed to ribbon thickness. 3 high-speed steel knives. Length of table, 33″, width 7⅜″. SKF ball bearings. Sturdy cast iron fence, 28″ long. Protractor depth gauge on front table. Operating speed, 4000-5000 r.p.m. Available with all-steel bench and belt guard. Two smaller Jointers also made by Walker-Turner.

GR57 MOTOR GRINDER

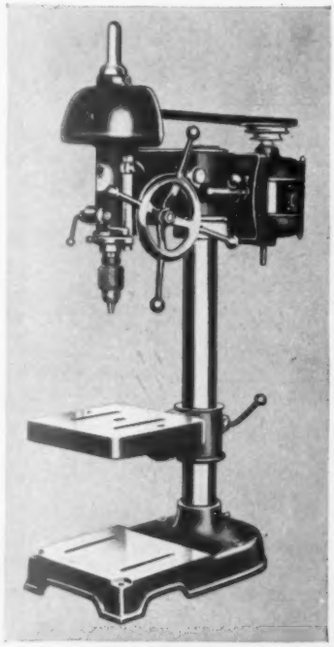


½ h.p. capacitator type motor, with built-in condenser, that affords plenty of overload capacity. Large grease-sealed SKF ball bearings. 7″ x 1″ wheels, guards that provide full protection. Snap switch mounted in base. Smaller Walker-Turner Grinder also built.

SERIES 900 TILTING ARBOR SAW

If your shop has never owned a tilting arbor saw, you've missed the convenience of a tool that's ideal for angle cuts in large or unwieldy stock. This model has a massive, rigid frame, 35″ x 26″ table, full horsepower motor, heavy duty SKF ball bearings, 10″ blade. Heavy tilting unit swings accurately, almost without effort. Cuts 3¼″ hardwood—greatest capacity ever offered in this price class.

SERIES 900 DRILL PRESS



The exclusive Walker-Turner 6 spline spindle cuts vibration to a minimum. 4 SKF ball bearings, one above and one below pulley, two in quill. Jacobs (0″ to ½″) Key Chuck. Spindle travel, 4″. Maximum distance chuck to table 12″, to base, 17″. Table tilts at any angle, locking device holds spindle in any position. Head may be inverted on column for spindle shaping. Four speeds. This drill press has proved itself on steady production in many industrial plants. Also available in two lighter models.

Engineered POWER TOOLS

AMERICAN SAW MILL MACHINERY CO.

HACKETTSTOWN, N. J.

We illustrate and briefly describe below a few of the more important MONARCH Woodworking machines suitable for school use. If you will advise us of your requirements, we will take pleasure in quoting you on machines exactly suited to your needs.

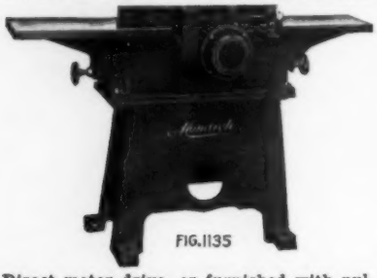
Monarch

Trade-Mark Reg. U. S. Pat. Off.

WOODWORKING MACHINERY OF QUALITY FOR INDUSTRIAL SCHOOLS

MONARCHS are modern, fast, accurate, sturdy, moderate in price. There is no compromise with quality; you are assured a machine giving accurate work, trouble-free operation, and a lifetime of service unobtainable with lighter, cheaply constructed, "price" machinery.

8", 12" AND 16" BALL BEARING JOINTERS



Direct motor drive, or furnished with pulley for belt drive. A precision tool, suited for fine pattern making or hard, continuous general service

SPEED LATHES

Ball bearing motor headstock as shown, or with motor in leg. A machine of great accuracy; compact, sturdy and efficient. Used in hundreds of pattern shops and industrial schools. Hand feed carriage with compound tool rest can be supplied

MONARCH PATENTED SAW GUARD AND KICK-BACK PREVENTER

In a class by itself. Completely guards both front and back of saw and provides absolute protection against "kick-back." Conforms with all safety requirements. May be applied to all our saw benches. Also furnished separately

VARIETY TILTING TABLE SAW BENCH

Ball bearing. Designed for a wide variety of fine and accurate work. Can be supplied with hollow chisel mortising attachment

DRUM AND DISC SANDER—BALL BEARING

A thoroughly modern machine, adjustable table and motor mounted in frame on hinged base. Equipped with sawdust chute and container. Also furnished as drum sander only

HIGH SPEED SINGLE SPINDLE SHAPER

Precision ball bearings. 10,000 R.P.M. Cuts without reversing against, across and with the grain. Quantity production with highest efficiency

HOLLOW CHISEL MORTISER—BALL BEARING

Motor or belt drive. For mortising in hard or soft woods. Free from vibration and easy to operate. Spindle speed 3600 R.P.M.

20" BALL BEARING BAND SAW

Built-in motor. Fully guarded, with indexed tilting table. A rugged, accurate machine, giving fine work and long life. ALSO 30"

TILTING ARBOR SAW BENCH

Ball bearings. 16" saw tilts to 45 degrees. Furnished with 2 or 3 H.P. motor. A modern, sturdy, compact machine with self-contained motor built in

"JEWEL" PLANER OR SURFACER

Plain or ball bearings as desired. An economical single surfacer for high-speed work; produces excellent work

MONARCH machines are made throughout of the finest materials, and embody the best of workmanship and finish. Table tops are carefully ground to insure flat, accurate surfaces; ball bearings are of the finest precision type; saws are of our own manufacture and of the highest quality; guards are of patented design meeting all safety requirements; the machines are guaranteed to give satisfactory service.

SEND FOR BULLETINS ON THESE OR OTHER MACHINES IN WHICH YOU ARE INTERESTED

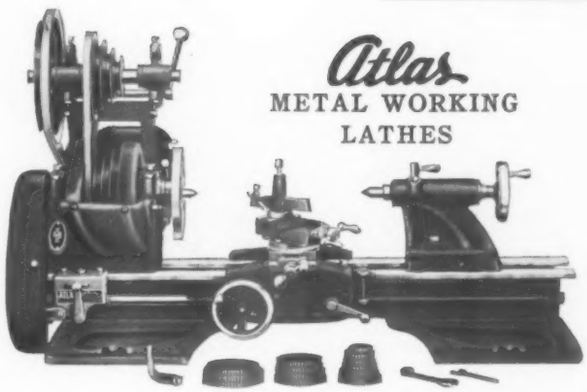
ATLAS PRESS COMPANY

1890 No. Pitcher Street, Kalamazoo, Michigan

SALES OFFICES

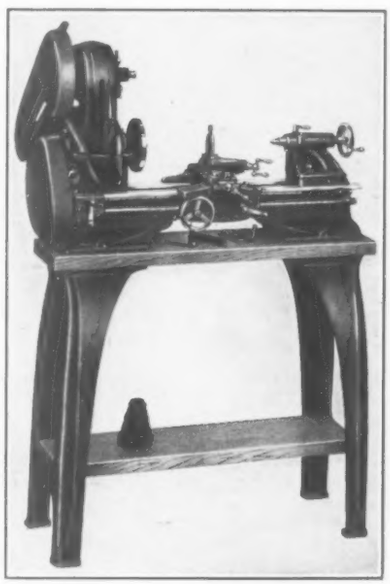
130 W. 42nd St.
New York City

35 E. Wacker Drive
Chicago, Illinois



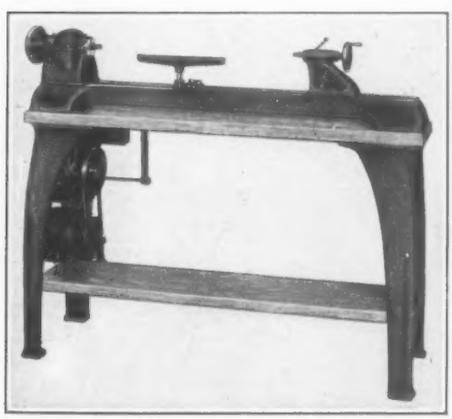
Atlas METAL WORKING LATHES

Atlas metal working lathes have been successfully proven in large and small school shops. The ideal combination for school use is illustrated at right—The Atlas lathe equipped with belt guards, table board and floor legs. Several bed lengths and attachments for all machine shop operations are available. The low cost will enable you to purchase several Atlas lathes for your school shop instead of one or two higher priced lathes. Investigate the many exclusive features of Atlas. Send for catalog.



Atlas DRILL PRESSES AND ATTACHMENTS

Outstanding values for the school shop. 4 sizes to meet every need. Original Atlas SKF ball bearing heads, splined spindles, balanced pulleys, built in switch, Jacobs chucks, full tilting tables—are but a few of the many features of Atlas drill presses. Made in both floor and bench models. Atlas drill press attachments may also be purchased to handle a wide variety of work.



Atlas WOOD WORKING LATHES

The Atlas wood working lathes are designed for the school shops desiring the best possible lathe they can obtain for this type of work. Made in 2 sizes —10 and 12 inch swing. Table board and floor legs also available with underneath motor drive. Deep grooved SKF ball bearing heads and sturdy construction throughout for inexpert student use.

Atlas GRINDERS

A size and price for every need. Atlas grinders are made in both floor and bench models. Fully guarded for student use. The floor model illustrated at left is equipped with the Atlas drill grinder — an attachment that may be purchased separately and used for grinding drill points accurately. This will save many dollars on drills that might otherwise be thrown away. See full description in catalog.

WRITE FOR LATEST CATALOG

Atlas automotive line production manufacturing methods enable us to provide many extra features on Atlas Equipment at no extra cost. These are all fully described in the new 1937 Catalog, copy of which will be mailed on request.

BROWN & SHARPE MFG. CO.

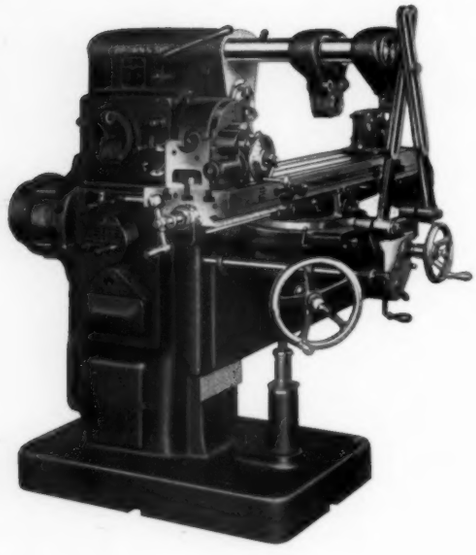
Established 1833

Providence, R. I.

Catalog on Request

"World's Standard B·S *of Accuracy"*

BROWN & SHARPE MACHINE TOOLS



MILLING MACHINES
GRINDING MACHINES
GEAR CUTTING MACHINES
GEAR HOBBING MACHINES
SCREW MACHINES

Investigate the No. 2 Light Type Universal Milling Machine (shown here) — an ideal machine for the school shop.

—convenient height
—easily operated
—individual Motor Drive

Write for detailed specifications

BROWN & SHARPE MACHINISTS' TOOLS AND CUTTERS

MICROMETERS
CALIPERS
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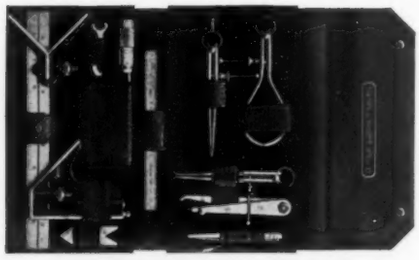
MILLING CUTTERS
END MILLS
FACE MILLS
SLITTING SAWS
GEAR CUTTERS
HOBS

ARBORS and COLLETS
GROUND FLAT STOCK
SURFACE PLATES
VISES and PUMPS



Ask about Sets of Tools for Students—Nos. 847, 848 and 849—desirable selections every shop student should own

THE AMERICAN SCHOOL AND UNIVERSITY

DELTA MANUFACTURING COMPANY

600-634 E. Vienna Avenue

Milwaukee, Wis.

EFFICIENT LOW-COST TOOLS FOR SCHOOL SHOPS

Delta Tools, because of their efficiency, accuracy, convenience and unusually low cost, have been adopted by hundreds of schools and universities all over the country. They are being used for vocational educational classes, laboratories, shops and maintenance departments.

NEW 11-INCH DRILL PRESS

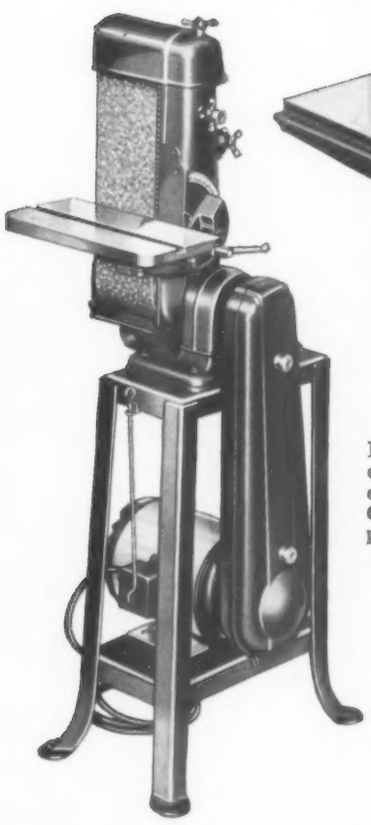
Built to the same standards of precision and accuracy as the 14-inch drill presses, this machine will drill, bore, shape, mortise, rout, sand, carve and grind just like the larger machines. Interchangeable spindles are available, with chuck equipment to suit any job. And it has all the engineered features of the larger machine—full-floating, ballbearing spindle and drive pulley, four speeds, tilting table with index pin, graduated quill and adjustable pointer, stop rod and all the other conveniences.

NEW 10-INCH BAND SAW

Has balanced enclosed disk wheels, running on New Departure double-seal ball bearings, patented table swinging on widely-spaced double trunnions, micrometer adjustment guides and ball-bearing blade supports above and below the table, with the lower-guide adjustments brought out to the front of the table for convenience and safety—and a full 6-inch capacity under the blade guide—where you need capacity in a band saw.

NEW 4-INCH JOINTER

It has the patented fence that insures sure, free action and unvarying accuracy of the settings patented swinging stop with its individually adjusted stop screws, swinging dual-control handle that makes control of the fence so convenient.



NEW 6-INCH BELT SANDER

Has numerous new features including complete double-sealed ball-bearing equipment, full 6 inches of sanding width. Operates in both vertical and horizontal positions.

NEW 17-IN. DRILL PRESS

The greatest drill press value ever offered. Has scores of unusual features. Get the full story in the 1937 Delta catalog.

SEND FOR COMPLETE CATALOG

The complete Delta line includes band saws, circular saws, scroll saws, drill presses, lathes, shapers, jointers and a full line of accessories. These tools are all ideal for school use. Their cost is low, well within even limited budgets. They are compact and flexible. They are the same tools that students will use in either home shops or industry. Write for latest catalog and full information regarding Delta Tools for schools and universities.

THE PECK, STOW & WILCOX COMPANY

ESTABLISHED 1819

PEXTO Southington Connecticut PEXTO

America's Leading SPECIALISTS in SHEET METAL WORKING TOOLS and MACHINES

In equipping your sheet metal working shop you want your students to have the great advantage of working with well-known standard equipment . . . identical in design and operation with equipment used in commercial sheet metal shops throughout industry. Pexto machines and tools have been first choice of experienced sheet metal workers for the past 118 years. You can furnish your shop complete in every detail from this one reliable source.

No. 137
Squaring Shear

No. 381 Slip Roll Former

No. 0581
Combination Crimper and Beader

No. 622
Deep Throat Combination Machine

No. 63
Adjustable Bar Folder with counter balance

No. 1544
Combination Machine and set of rolls

No. 696
36" Combination Brake and Folder
20 Gauge Capacity

Equally important to you in planning a new or expanded sheet metal department is the fact that Pexto has had long and successful experience in working with trade and vocational schools throughout the country. Properly planned sheet metal working courses offer students broad and essentially practical instruction in work with metals, in the making of shop drawings and patterns and in the use of a great variety of hand tools. Yet the investment cost for equipment is lower than for other mechanical courses and work materials are very inexpensive.

Send us an outline of your plans and available facilities. Let us show you how much can be done on a limited appropriation in training students for one of Industry's most interesting and promising fields.

SCHOOL SHOP PLAN BOOK

Sent Free on Request

An invaluable aid to instructor and student alike. Illustrates the essential equipment and tool items and describes their use. Contains equipment lists and typical shop layout plan. Specially prepared for the use of trade and vocational schools.

The PEXTO Line is Complete

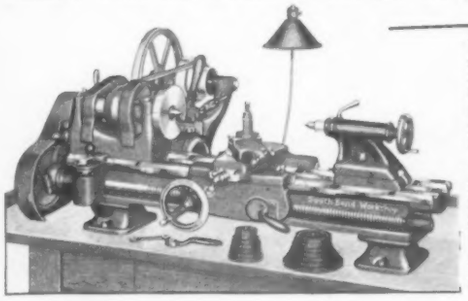
Squaring Shears	Folders	Formers
Foot Shears	Brakes	Groovers
Bench Shears	Wiring, Burring,	Stakes
Slitting Shears	Setting Down,	Bench Plates
Circle Shears	Turning, Beading,	Hand Tools
Ring and Circle Shears	Elbow Edging,	Gas Furnaces
Scroll Shears	Crimping and Seam-	Soldering Coppers
Punch Presses	Closing Machines	Steel Squares and Rules

Our experts will be glad to help you select the basic equipment best suited to your needs and budget. Write us.

SOUTH BEND LATHE WORKS

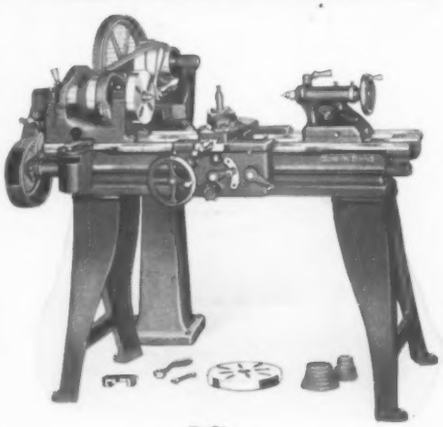
473 East Madison St., South Bend, Ind., U. S. A.

Manufacturers of New Model South Bend, Back-Geared Screw Cutting Lathes; 96 Sizes and Types of Quick Change Gear and Standard Change Gear Lathes; Lathe Builders for 30 Years; Over 75,000 South Bend Lathes in Use

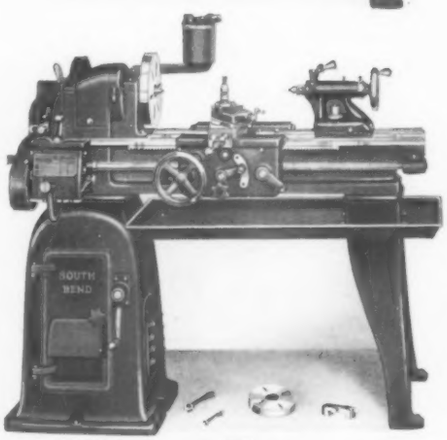


No. 415-YA 9″ x 3′ Workshop Back-Geared, Screw Cutting, South Bend Precision Bench Lathe **$85.00**

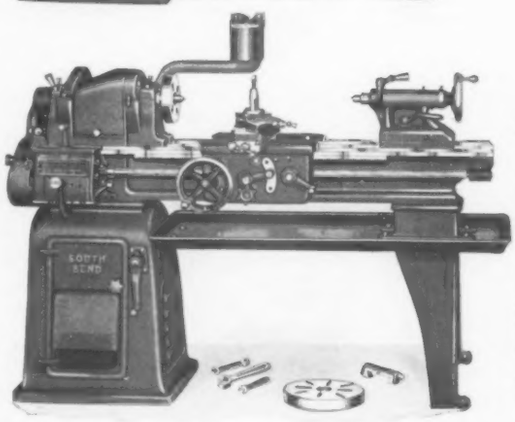
With Belt Tension Horizontal Motor Drive, Motor, Switch, belts, and lathe equipment as shown, less bench, shipping weight 320 lbs. **$116.00**



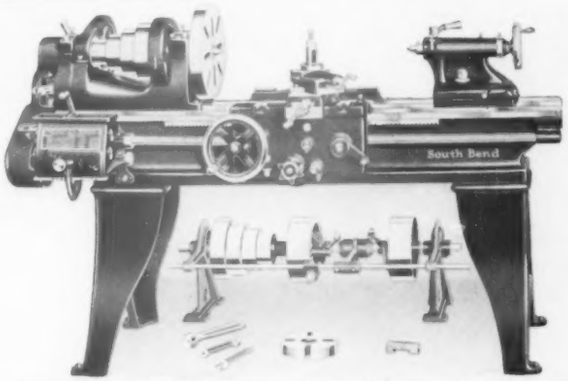
No. 910-A 11″ x 4′ New Model Standard Change Gear, Back-Geared, Screw Cutting, Pedestal Adjustable Motor Drive South Bend Precision Lathe, complete as shown, Shipping Weight 848 lbs. **$382.00**



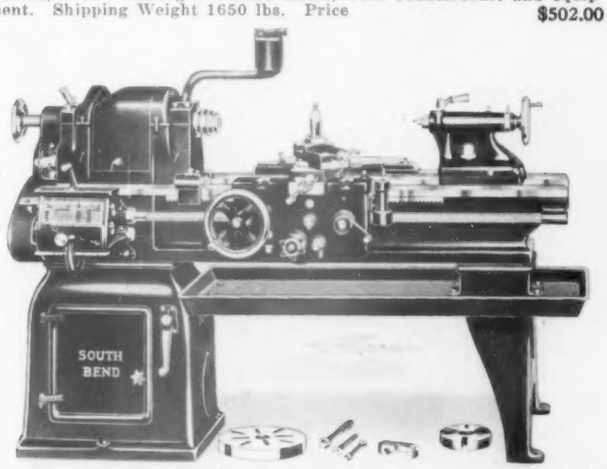
No. 111-A 11″ x 4′ New Model Quick Change Gear, Underneath Belt Motor Drive South Bend Back-Geared, Screw Cutting, Precision Lathe. Shipping Weight 1010 lbs. Price Complete with ½ H. P. 3 phase, 60 cycle, A. C. Motor, Switch, and Equipment, including Chip Pan. **$511.00**



No. 113-B 13″ x 5′ Quick Change Gear, Underneath Belt Motor Drive, Precision Lathe with 3 phase, 60 cycle, A. C. Motor, Switch, and Chip Pan. Shipping weight 1565 lbs. **$623.00**



No. 14-C 15″ x 6′ Quick Change Gear, Countershaft Drive, Back-Geared, Screw Cutting Precision Lathe, with Countershaft and equipment. Shipping Weight 1650 lbs. Price **$502.00**



No. 8117-C 16″ x 6′ Tool Room Quick Change Gear, Underneath Motor Drive Precision Lathe, with 3 phase, 60 cycle, A. C. Motor, Switch, and Attachments, including Draw-in Collet, Taper, Thread Indicator, Chip Pan, and carriage stop. Shipping Weight 2525 lbs. **$986.75**

OVER 4000 SCHOOL USERS

Detroit Public Schools	339
Chicago Public Schools	205
Baltimore Public Schools	134
Philadelphia Public Schools	127
Columbus Public Schools	86
Milwaukee Public Schools	84
Cleveland Public Schools	76
Pittsburgh Public Schools	59
Springfield, Mass., Public Schools	55
Seattle Public Schools	54
Kansas City, Mo., Public Schools	50

The new model South Bend Precision Lathes are used by the leading industries for doing work of the highest accuracy and precision. They are the ideal metal working lathes for instructing students in modern industrial practice.

WRITE for These Books

Containing valuable information to all Directors, Supervisors, and Instructors. Kindly ask for Bulletin No. 55-W, and Catalog No. 95. Copies mailed free.

STANLEY TOOLS

EDUCATIONAL DEPARTMENT

New Britain, Conn.

STANLEY "Boy Proof" TOOLS

FOR WOODWORKING AND FARM SHOPS • ELECTRICAL SHOPS • FORGE SHOPS SHEET METAL SHOPS • AUTOMOBILE SHOPS • MACHINE SHOPS

No. 52½ 10 Oz. HAMMER

Super heat treated head. Evertite oil treated handle of selected straight grain hickory. Patented wedges.

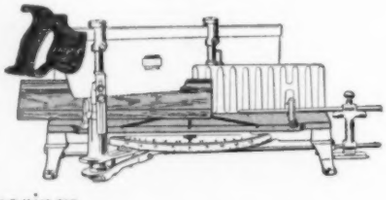
No. R40 EVERLASTING CHISEL

No lost or battered handles. Rubber composition handle, practically unbreakable, moulded about shank. Blade, shank and head one piece of finest steel.

No. 617 HAND DRILL

New chuck with hairpin type springs. Heavy crank, solid wheel, several other important features. ¼" chuck capacity. Hand Drill No. 626 has ⅜" chuck capacity.

No. 2246 MITRE BOX

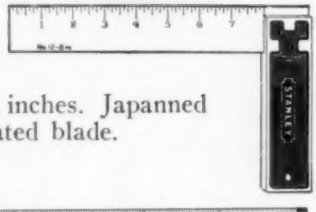


Simplified design. Swivel and uprights one piece of malleable iron. Malleable iron saw guides with roller bearings.

No. 80M SCRAPER

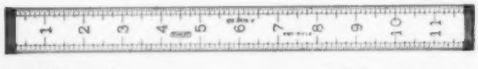
Practically unbreakable. Body and handles one piece of malleable iron.

No. 12 TRY SQUARE



Graduated in eighths of inches. Japanned finish handles. Nickel-plated blade.

No. 34½V BOX-WOOD RULE



Improved vertical figures—easy to read in any position. One side graduated in eighths of inches—other side in sixteenths. Brass tips protect ends.

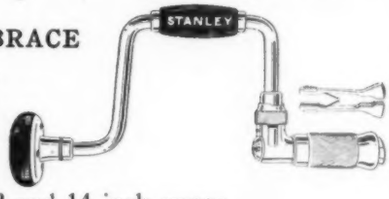
No. 5¼ JUNIOR JACK

Well balanced, lightweight. Ideal size for Junior High School student.

No. 118 BLOCK PLANE

All steel. Minimum number of parts. Lowest cutting angle.

No. 919 BIT BRACE



Self-centering chuck, all parts locked in place. Bronze bushed ball bearing head. Made with 8, 10, 12 and 14 inch sweep.

No. 20 SCREW DRIVER

Standard blade. Blade, shank and head hot forged from one piece of steel.

No. 151M SPOKE SHAVE

Malleable Iron—practically unbreakable. Cutters of finest steel correctly hardened, tempered and sharpened.

•

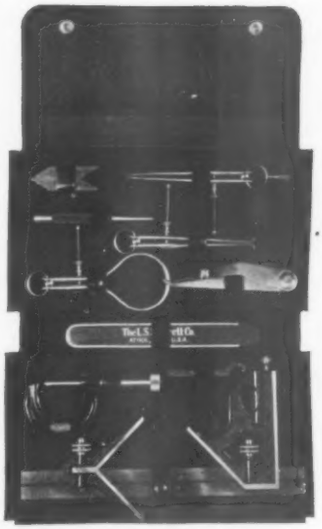
SEND FOR SPECIAL SCHOOL CATALOG NO. 34A

Catalog 34A, in its 204 pages, contains much useful material in addition to complete descriptions and specifications on Stanley Tools. Get your copy free and use it as a handbook for tools and their use.

THE L. S. STARRETT CO.

World's Greatest Toolmakers—Manufacturers of Hacksaws Unexcelled
Steel Tapes—Standard for Accuracy

Athol, Mass., U. S. A.



Starrett Student Set
No. 902

Starrett Tools are standard school shop equipment. The features that make Starrett Tools the choice of experienced craftsmen are just as helpful to students and apprentices.

Starrett Student Kits are made up of the tools which instructors agree are essential for class projects. The tools which they contain are all of genuine Starrett quality. They combine accuracy and durability in a way that gives lasting service and satisfaction.

The Starrett Kits and more than 3,000 fine mechanical tools, tapes, rules and hacksaws are completely described and illustrated in the new revised edition of Starrett Catalog No. 25 SU. Write for a copy.

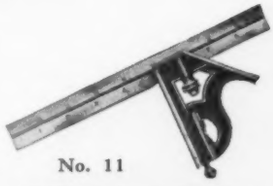
No. 230

No. 436

STARRETT EDUCATIONAL SETS

Designed to teach classes how to use precision tools, the Starrett Educational Set is a valuable aid to instructors. It consists of fourteen 8″ x 10½″ blue-printed pages, punched to fit a standard student's notebook. Each page illustrates a different tool and shows how to use it. Furnished to instructors and students at cost—10c. per set.

No. 153



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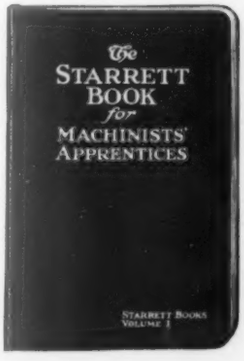
Starrett Student Set
No. 900

No. 425

No. 92

No. 305

No. 530



STA-WARM ELECTRIC COMPANY

Ravenna, Ohio

PRODUCTS

Sta-Warm Electric Glue Heating Pots and Soldering Irons.

USES

For the economical, efficient, safe heating of glue in Manual Training, Woodworking, Cabinet-Making and Pattern Shop Departments of Schools and Universities—as well as in the building and equipment maintenance departments of such institutions.

ADVANTAGES

1. Better, more uniform results through the use of properly, efficiently heated glue.
2. Safety—reduces fire hazard and obnoxious fumes.
3. Efficiency—no water jackets and constant manual attention required.
4. Modern—teaches the methods now in use in modern, progressive factories and plants.

One of the Sta-Warms Will Suit Your Needs.

TRIPLEX GLUE POTS

An inexpensive efficient Glue Pot with 3 Heats

Heats glue by the modern electrical "dry-heat" method—with Sta-Warm element baked to bottom and wall of pot; asbestos insulation—no water jackets—uniform heat from top to bottom—has a three-heat switch; Low (140°) for intermittent use; Medium (170°) for continuous use; High (200°) for quick heating.

Model	Capacity	Shipping Wt.	Rated Wattage
101	1 qt.	5 lbs.	165 Watts
102	2 qt.	7 "	220 "
104	4 qt.	10 "	330 "

STA-WARM ELECTRIC GLUE POTS

With precise, automatic thermostatic control

Patented Sta-Warm multiple current element is cemented to walls and bottom of pot—gives an absolutely even heat from top to bottom, no cold spots—Temperature of glue is controlled by a patented automatic thermostat which maintains glue at 145-150° F., the best heat to develop the maximum properties of the glue—it cannot go higher and burn; it cannot go lower and lose "sticktivity."

Model	Capacity	Ship. Wt.	Initial Wattage	Approx. Consumption 8 Hr. Day
400	1 pt.	6 lbs.	187 Watts	.248 KWH
401	1 qt.	7 "	264 "	.45 "
402	2 qt.	11 "	363 "	.55 "
404	4 qt.	16 "	573 "	1.2 "
605	8 qt.	34 "	737 "	2.7 "

STA-WARM ELECTRIC GLUE COOKERS

5 to 50 gal. sizes with fixed or variable thermostatic control

Efficient in the heating, preparation or manufacturing of large glue batches. Utilizes the modern, electric "dry-heat" method, with patented heating element cemented to walls and bottom of tank—gives even heating throughout. Either a fixed or variable, calibrated thermostatic control is furnished to suit your heating specifications. Hand (pictured) or electric motor-driven bronze blade agitators are available.

Model	Capacity	Weight	Initial Wattage	Approx. Consumption 8 Hr. Day
900	5 gal.	100 lbs.	1.05 KW	2.88 KWH
901	10 "	135 "	1.93 "	4.8 "
902	15 "	200 "	3.16 "	5.4 "
903	25 "	275 "	5.94 "	7.5 "
904	50 "	460 "	8.58 "	14.0 "
904 M	50 "	600 "	8.58 "	14.0 "

STA-WARM ELECTRIC SOLDERING IRONS

A quality-built soldering iron made with readily and easily detachable copper tips of the friction expansion type. Cord is attatched by a new twist-lock plug that always holds, always assures good heating. Built to last a long time.

Model	Size of Point	Weight	Rating
701	3/8" cop.	2 lbs.	100 Watts
702	3/4" cop.	2 "	175 "
703	1 " cop.	3 "	220 "
704	1 1/2" cop.	4 "	330 "

WICKES BROTHERS

Manufacturers of

Continuous Electric Blue Printing Machines

Saginaw, Mich.

Established 1854

WICKES SIMPLEX BLUE PRINTER

CONTINUOUS ELECTRIC OPERATION

A TROUBLE-FREE MACHINE ADMIRABLY SUITED TO SCHOOL USE

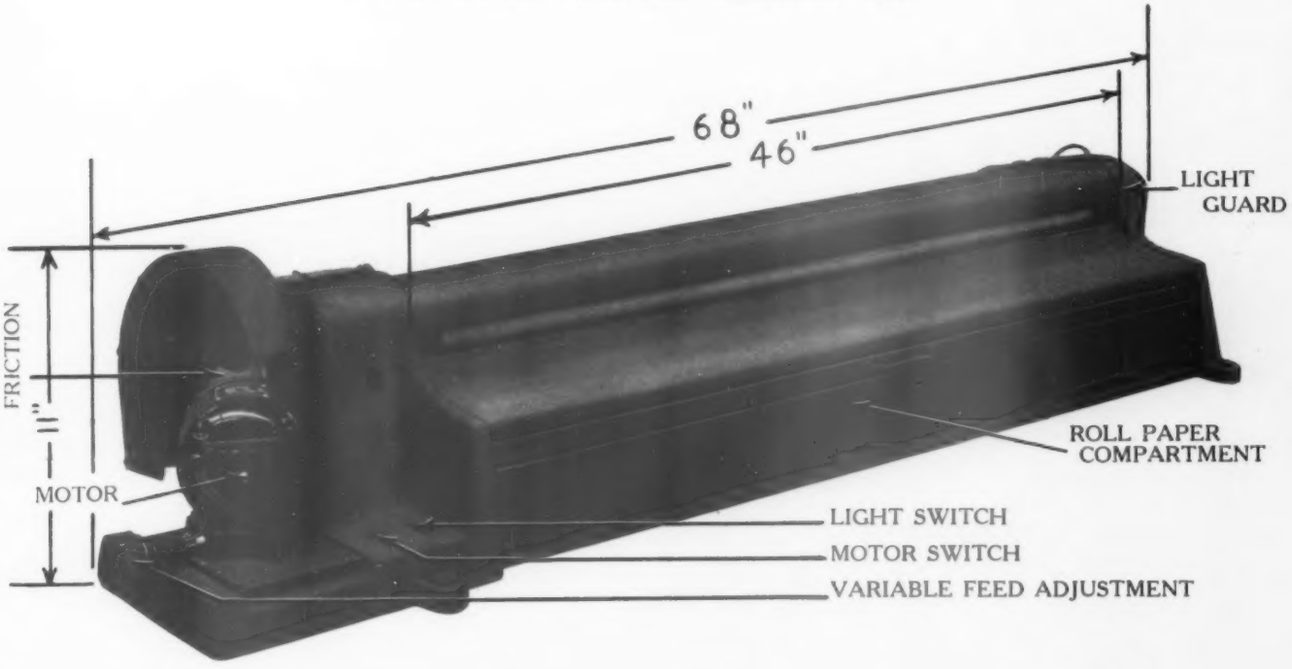
Automatic and continuous reproduction of tracings to blue prints.

Vandykes and other direct process prints.

—Separate sheets also—

The feed is one plain endless belt surrounding the Pyrex cylinder, driven by motor of ample horsepower. No gears nor belts to shift. 5 amperes, 110-volt, total current.

WRITE FOR FURTHER INFORMATION



THE AMERICAN SCHOOL AND UNIVERSITY

SECTION X
TRANSPORTATION SERVICE

PUPIL TRANSPORTATION IN THE STATE OF NEW YORK

BY BURTON H. BELKNAP

Associate Supervisor, Rural Education Division,
New York State Education Department

PUPIL transportation in rural areas has become a major administrative problem. This is particularly true in the state of New York, where the number of pupils transported annually has increased from approximately 17,000 to more than 110,000 in a 7-year period. This increase has been brought about partly by enlargement of local administrative units in the case of central district organization, and partly by a recent statute which provides for the transportation of pupils of high-school grade by districts not maintaining high-school departments.

The Basis of Success

The success of the service has been due in part to the establishment of standards and policies by the Rural Education Division of the State Education Department, and in part to acceptance of responsibility by district superintendents and local school officials. The private contracts, arrangements with drivers of district-owned buses and public service companies, are required to be left with the Education Department in advance of service, there to be approved and filed. Later these arrangements are referred to in checking claims for state aid. (Central, union free and consolidated districts receive a refund of 50 per cent of approved costs of transportation within the district, and districts not maintaining high-school departments receive the same refunds from the state for transportation of pupils to high-school departments in outside districts.) Other transportation expenditures must be covered by contracts approved by the Education Department, in order to legalize the expense as a general district expenditure. As time passes, the revisions and refinements in forms used tend toward still better understandings and assurance of a greater degree of care.

Studies of Transportation Costs

Transportation costs being a major factor, yearly studies are made of the transportation of the state as a whole, and the findings are used in bringing about more economical service without limiting the safety or comfort of the pupils transported. Boards of education are assisted in bringing about economical service.

The usual analysis of transportation contracts, district-owned and public service forms as of January 25, 1936, is of rather unusual interest. (See Tables I and II.) For the past several years there has been a marked increase in the number of pupils transported. This normal increase represents approximately 10,000 pupils per year. As in the past, this increase is largely from the common districts, while notable increases are also made by central districts. Each year more common districts are being absorbed by centralization.

Unit costs have gradually decreased for the past several years. However, four factors, tending toward increases, have been operative during the past year. These factors include: (1) general increase in living costs; (2) more exacting standards affecting motor vehicles; (3) reduction in the number of pupils allowed to be carried in sedans; (4) increase in insurance requirements. The effect of these factors combined is reflected in slightly higher unit costs, as shown by the tabulations. It should be observed that extension of cooperative service and better-planned transportation service generally has kept these increases at a minimum.

TABLE I

PUPILS TRANSPORTED, ARRANGED BY TYPE OF DISTRICT—1935-36

	Common & Consol.	Union Free	Central Rural	Village Suptncies.	Totals & Averages
Number of districts	4,941	265	160	35	5,401
Conveyances	5,270	516	1,069	116	6,971
Pupils	47,434	20,931	33,740	7,649	109,754
Daily round-trip mileage.	77,721	8,831	17,161	1,231	104,928
Av. round-trip mileage ..	14.9	17.1	16 +	16.1	15 +
Av. number of pupils	9	40	33	66 —	16 —
Av. per pupil cost	$53.39	$28.78	$40.09	$25.54	$42.66
Av. per pupil-mile cost ..	.0188	.0088	.0132	.0083	.0149

COMPARISON OF 1935-36 FIGURES WITH THOSE FOR PREVIOUS YEAR

The total number of districts providing transportation of one kind or another has increased by 665. Common districts with a gain of 655 in number largely explain this increase. The number of conveyances has been increased by 655. This increase is also largely in common districts where cooperative arrangements are more difficult to work out. Past experience, however, would indicate that in due time many of the individual district arrangements will give way to cooperative service.

The number of pupils tranported shows an increase of 6,670 pupils from common districts, slight increases from union free and village districts, while central districts show a 3,106-pupil increase.

The increase in daily round-trip mileage is largely shown by common and union free districts. The total round-trip mileage of 104,928 miles as against 98,044 miles for the year 1934-35 shows an increase of 6,884 miles daily.

The average round-trip mileage by all districts is so little different from figures for the year previous as to be disregarded. The average number of pupils per conveyance, however, indicates that the average load per conveyance in union free districts has been reduced by 20 per cent, while the number of pupils per conveyance in central districts has been increased by 10 per cent. This latter fact is quite largely explained by central districts purchasing buses of the larger capacities.

The unit costs, as indicated above, show small increases over those for the year previous. In common districts, the average increase is from $51.38 to $53.39, or an increase of $2.01 per pupil. In union free districts, the increase has been but 25c. per pupil, while in central districts the average cost per pupil has increased from $38.55 to $40.09, or $1.54 per pupil. In village superintendencies, the per pupil cost has decreased from $26.96 to $25.54, or $1.42. The average per pupil cost for all districts is now $42.66 as against $41.44 for the past school year, while the per pupil-mile cost is shown to be .0149 as compared with .0143 for the school year 1934-35.

Service provided by district-owned buses has been proven less expensive than other types of service. Public service companies provide rates only slightly higher than for district-owned buses, while private contracts are usually considerably higher. Service necessitating the use of sedans, or sedans and horse-drawn conveyances, proves most expensive. Poor road conditions, lack of proper snow removal, and sparse population, account for much of this type of transportation service. However, as road conditions improve, cooperative arrangements between districts in the use of bus type service materially reduce the costs. A statute permitting districts that own buses to make contracts with other districts has still further reduced costs.

Safety

Safety of pupils in transit is arrived at from several angles. Routes and conveyances must be approved by the district superintendent, and conveyances must meet standards established by the State Public Service Commission and the State Education Department. Conveyances are also inspected at least once in four months by representatives of the Public Service Commission, and only conveyances that meet requirements are given certificates of approval. A conveyance may not legally operate unless so certified.

TABLE II

PUPILS TRANSPORTED, ARRANGED BY METHOD OF CONVEYANCES—1935-36

	District-Owned	Private M.V. Contracts	Public Service	Combination M.V. & H.D.	Totals & Averages
Conveyances	863	4,764	959	385	6,971
Pupils	37,261	50,366	19,671	2,456	109,754
Daily round-trip mileage..	17,856	68,996	14,316	3,760	104,928
Av. round-trip mileage ..	20.7 +	14.5—	14.9	9.8 —	15 +
Av. number pupils	43.2	10.6	20.5	6.4	16 —
Av. per pupil cost	$37.07	$49.28	$32.35	$78.39	$42.66
Av. per pupil-mile cost ..	.0094	.0179	.0114	.0421	.0149

COMPARISON OF 1935-36 FIGURES WITH THOSE FOR PREVIOUS YEAR

District-owned conveyances have increased from 741 to 863, while motor vehicles under private contract have increased in number from 4,128 to 4,764. Public service conveyances have decreased in number from 985 to 959, and combination arrangements (motor-vehicle and horse-drawn conveyances) have decreased from 462 to 385 in number.

Pupils transported in district-owned conveyances have increased in number from 32,141 to 37,261 for the present year, while motor vehicles under private contract show an increase from 44,821 to 50,366 pupils. These two methods of conveyance, therefore, account for 10,665 additional pupils, while public service conveyances show a lesser number of pupils transported than formerly. The combination arrangements show a decrease from 3,030 to 2,456 pupils. Daily mileages by district-owned buses and motor vehicles under private contract show corresponding increases, while daily mileages by public service conveyances and combination arrangements show comparable decreases.

Average round-trip mileages show a slight decrease from all conveyances except for combination arrangements, which show somewhat of an increase. The average for the entire group is practically the same as for the year past.

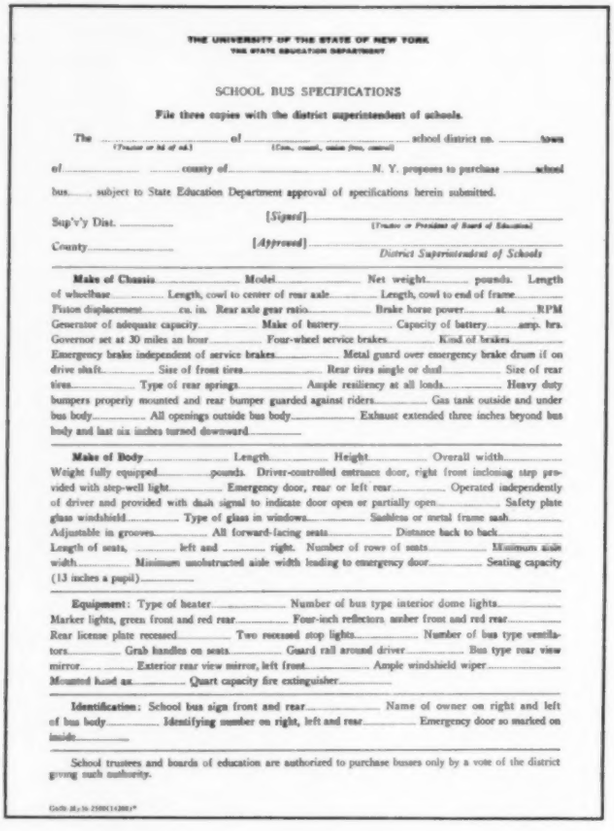
The average number of pupils per conveyance is not materially different from the year 1934-35.

Unit costs show that district-owned buses average $1.51 higher than for the past year, while motor vehicles under private contract average $1.07 higher per pupil. Public service costs range $.93 higher, and combination arrangements, fewer in number than for the past year, average $6.72 higher per pupil. The district-owned buses show the lowest per pupil-mile costs with public service conveyances coming second; motor vehicles under private contract are third, and combination arrangements last.

Requirements for Drivers

Drivers are the next major consideration. School officials are expected to use due care in their selection. Through Education Department ruling, drivers must be at least 21 years of age. They must, by law, possess a driver's license for driving in strictly rural territory, and a chauffeur's license in case any part of their routes includes city driving. Good character, dependability and ability to manage children are other proper considerations.

Extreme care is required to be exercised in loading and unloading, and bus type conveyances are required to operate with governors set at 30 miles per hour. The state has still further safeguarded pupils in entering and leaving buses along the highways by the passage of a law requiring all vehicles on the highways to come to a stop when approaching school conveyances (so marked), when loading or unloading, and to proceed with caution from a complete stop.



THE UNIVERSITY OF THE STATE OF NEW YORK
THE STATE EDUCATION DEPARTMENT

SCHOOL BUS SPECIFICATIONS

File three copies with the district superintendent of schools.

The ..... of ..... school district no. ..... town
(Trustee or bd. of ed.) (Com., council, union free, central)

of ..... county of ..... N. Y. proposes to purchase ..... school bus..... subject to State Education Department approval of specifications herein submitted.

Sup'v'y Dist. ..... [Signed] .....
(Trustee or President of Board of Education)

County ..... [Approved] .....
District Superintendent of Schools

Make of Chassis ..... Model ..... Net weight ..... pounds. Length of wheelbase ..... Length, cowl to center of rear axle ..... Length, cowl to end of frame ..... Piston displacement ..... cu. in. Rear axle gear ratio ..... Brake horse power ..... at ..... RPM Generator of adequate capacity ..... Make of battery ..... Capacity of battery ..... amp. hrs. Governor set at 30 miles an hour ..... Four-wheel service brakes ..... Kind of brakes ..... Emergency brake independent of service brakes ..... Metal guard over emergency brake drum if on drive shaft ..... Size of front tires ..... Rear tires single or dual ..... Size of rear tires ..... Type of rear springs ..... Ample resiliency at all loads ..... Heavy duty bumpers properly mounted and rear bumper guarded against riders ..... Gas tank outside and under bus body ..... All openings outside bus body ..... Exhaust extended three inches beyond bus body and last six inches turned downward .....

Make of Body ..... Length ..... Height ..... Overall width ..... Weight fully equipped ..... pounds. Driver-controlled entrance door, right front inclining step provided with step-well light ..... Emergency door, rear or left rear ..... Operated independently of driver and provided with dash signal to indicate door open or partially open ..... Safety plate glass windshield ..... Type of glass in windows ..... Sashless or metal frame sash ..... Adjustable in grooves ..... All forward-facing seats ..... Distance back to back ..... Length of seats, ... left and ..... right. Number of rows of seats ..... Minimum aisle width ..... Minimum unobstructed aisle width leading to emergency door ..... Seating capacity (13 inches a pupil) .....

Equipment: Type of heater ..... Number of bus type interior dome lights ..... Marker lights, green front and red rear ..... Four-inch reflectors amber front and red rear ..... Rear license plate recessed ..... Two recessed stop lights ..... Number of bus type ventilators ..... Grab handles on seats ..... Guard rail around driver ..... Bus type rear view mirror ..... Exterior rear view mirror, left front ..... Ample windshield wiper ..... Mounted hand ax ..... Quart capacity fire extinguisher .....

Identification: School bus sign front and rear ..... Name of owner on right and left of bus body ..... Identifying number on right, left and rear ..... Emergency door so marked on inside .....

School trustees and boards of education are authorized to purchase busses only by a vote of the district giving such authority.

Form 31-1-16-25M(1428)*

Insurance

Another item of protection is that of insurance. Recently, the minimum requirements have been raised in terms of the number of pupils being transported. While conveyances are licensed on a basis of adult capacity, insurance is checked on a basis of number of pupils carried at any one time. In order to make certain of insurance coverage, the State Motor Vehicles Bureau insists that insurance policies, good for the life of the license and plates issued, be filed with this Bureau before license and plates are issued. In the case of sedans, distinctive plates (SB) are issued in all cases.

Equipment Specifications

Both safety and economy are furthered by more exacting specifications covering new bus equipment purchased by the districts or by private contractors. Bus requirements set up by the Public Service Commission in carrying out the provisions of the statute regarding motor-vehicle inspections have been incorporated into State Education Department requirements and recommendations. Chassis and bus body manufacturers have cooperated willingly in putting requirements into effect.

It is required that the minimum chassis weight shall equal the pupil load when allowing 100 pounds per pupil. Chassis must be of such length, and body so mounted, that at least two-thirds of the body length is in front of the center of the rear axle. In the case of the larger bodies, it is recommended that at least 70 per cent of the body length be in front of the center of the rear axle.

Performance requirements specify that piston displacement and rear axle gear ratio shall be such that the bus when loaded to capacity shall be able to make a 3 per cent grade on a first-class road in high gear. It is also required that power be ample for satisfactory performance in all gears when operating with a governor set at 30 miles per hour.

Other requirements include: all forward-facing seats; 13 inches seat space per pupil, and seats on a minimum of 27-inch centers; 12 inches minimum aisle width; safety glass throughout; emergency door operating independently of driver; step-well provided with step-well light; signaling device indicating emergency door open or partly open; ample lighting inside and out; provision for heat independently of exhaust gases; forced ventilation in keeping with the size of the bus body; and window sash operating in grooves in such a way that when fully lowered the sash shall extend 8 inches above the lower window line. Guards at windows are not required; however, the window at left of driver must lower to level of window-sill. Specifications filed, and later field check tend to safeguard in these matters.

Batteries, generators and tires are required to be in keeping with the particular bus needs. Gross tire capacities are checked with the recommendations of the Tire and Rim Association. Emergency equipment required includes an axe, a fire extinguisher, and a set of flares, in addition to reflectors both front

and back. Double windshield wipers and both internal and external rear-view mirrors are included in regular equipment.

There are no requirements as to color, but each bus must be distinctly marked (School Bus) in letters 4 inches in height, both front and rear. Heavy-duty bumpers, both front and rear, must be securely attached to the chassis frame; the license plate in rear must be recessed in the body and properly illuminated. The gas tank must be outside and under the bus body, and the exhaust insulated with non-inflammable material, if within 12 inches of the gas tank or under the gas tank, regardless of distance. The exhaust must also extend 3 inches beyond rear of body, and the last 6 inches must be turned downward.

Conveyances meeting the above requirements are providing safety to pupils transported, and economy in operation. Each year more common districts are being absorbed by centralization.

New York State Requires Forward-Facing Seats with at Least 13 Inches Seat Space per Pupil; and Safety Glass Throughout

This Bus, Like That on Page 516, Is Marked SCHOOL BUS in front and Rear, and Both Ends Are Protected by Heavy-Duty Bumpers

STATE-WIDE SCHOOL TRANSPORTATION AT MINIMUM COST

BY LLOYD GRIFFIN

Executive Secretary, North Carolina State School Commission

NORTH CAROLINA is a rural state, having next to the largest rural population in the South, exceeded only by Texas. It has a public school enrolment of 900,000 children. Every fourth person is a school child. There are no large cities in the state. The rural character of the state and the sparsely settled sections create a problem of rural transportation for the public schools which is perhaps larger than that of any other state in the union. This is particularly emphasized by the fact that 275,000 children were transported to and from the public schools daily during the past school year.

In 1933 the General Assembly abolished all existing school districts in North Carolina and authorized the State School Commission to establish new districts throughout the state. As a consequence of this legislation, the number of school districts in the state was reduced from 2,700 to less than 800, resulting in a program of consolidation of the various small schools into districts each containing enough elementary schools to produce a sufficient number of students to maintain a standard central high school. Consequently, buses are now routed in such a way that the children are transported to the nearest public school, at the least cost, without regard to district lines and, in many instances, without regard to county lines.

The State School Commission is charged with the responsibility of laying out all bus routes in the state. Maps showing in detail the roads in every county in the state, and the location of the school buildings, show also the route to be followed by each bus, the number of miles traversed, the age and make of the bus, the driver's name, the starting point of the route, and the total mileage per day. The routes are laid out during the summer months and are checked, verified, and amended where shifts in population make changes necessary. This system has worked satisfactorily and makes it possible to get within a mile of every child in the state who lives more than a mile and a half from the school building, without traveling unnecessary mileage or duplicating bus routes.

School-bus drivers are selected by the principal of the school and the local district committee. Eighty per cent of the drivers are students. They are selected on a basis of their alertness and all-around dependability. Our experience has shown that a seventeen-year-old high school boy is the safest and most dependable driver to be had. As the result of student driving, we have had but few accidents. Our conclusion is, from the records, that students are safer than adults as school-bus drivers.

Cost of Operation

During the school year 1935-36 we transported 275,000 children at an average operating cost of $4.90 per child for a period of 160 days, or a fraction above 3

Photograph by courtesy of Hackney Bros. Body Co.

All School Buses Are Painted the Same Color and Can Be Recognized Wherever Seen. All Bodies Are Purchased and Constructed on Bids and Specifications of the State School Commission

DESCRIPTIVE SUMMARY

COM. REP. COUNTY SUP'T.
ADDRESS:

DISTRICT NO.	NAME OF SCHOOL	NAME OF DRIVER	AGE	BUS. NO.	MAKE OF CHASSIS	MODEL YEAR	BODY LENGTH	ROUTE NO.	PUPILS TRANSPORTED DAILY FOR 1936-1937	TOTAL DAILY MILEAGE FOR 1936-1937	REPORTED MILEAGE FOR 1935-1936	BUSSES ELIMINATED	

MAJOR OVERHAUL OR SUMMER REPAIRS

(The information below is to be compiled from work tickets and entered before Bus leaves garage for service at beginning of school year. This repair record is to be transferred to back page of this book and made a part of annual operating expense.)

BUS No. MAKE MODEL MECHANIC

DATE	(1) REPLACEMENT PARTS	COST	(2) LABOR HRS.	COST	(3) TIRES & TUBES	COST	TOTAL COST 1, 2, 3, 4, 5
	(4) BODY REPAIRS						
	(5) MISCELLANEOUS						

Above—Forms Like This Are Filled Out for Statistical and Descriptive Information on Bus Routes

Left—Major Repairs Made During the Summer Months Are Entered on Inside Cover of Driver's Report Booklet

cents per day per child, over a total mileage of 22,000,000 miles at an operating cost of 6 cents per mile. These results were obtained because:

1. A high percentage of the drivers are students, and since they attend school they receive only $9 per month of 20 days' bus driving.

2. All gasoline is centrally purchased under one contract at a cost of approximately 14 cents per gallon, including tax.

3. All supplies, materials, and repair parts are purchased under state contract and discounts taken.

4. All replacement buses are purchased under one contract and paid for by the state with one voucher, thereby enabling the state to secure a very low price per bus. The total operating cost for transportation during the past year, including capital outlay for buses, did not exceed 9 cents out of the school dollar.

Of the 4,000 school buses now in operation in North Carolina, 2,000 are replacement buses put in operation within the last three-year period, varying in length from a minimum 15-foot body to a 19-foot body. All bodies are purchased and constructed on bids and specifications of the State School Commission.

Inspection

The state maintains constant inspection of the mechanical condition of the buses and their seating capacity; requires frequent servicing of trucks with grease and oil; and by daily reports from each school, obtained from the driver of each bus, a constant check is maintained as to the actual condition of the bus, number of pupils transported, and defects noted. Inspection of bus routes is constantly being made in order to insure that the drivers are following the proper routes and that the routes laid out are in an all-weather condition. Repair shops are inspected, mechanics are visited, and information is exchanged in order that the best and most improved methods of repair and servicing of buses may be employed by all mechanics in the state.

Use of Buses

The school buses are used for no other purpose than transporting children to and from school. Neither the drivers nor any of the school authorities can use them privately. Each county has a large garage in which the buses are stored during the summer months. During this period the buses are inspected, all major re-

Courtesy of AutoFyrStop Co.

A Typical Bus Engine Fitted with an Automatic Fire Extinguisher

DRIVER'S BUS REPORT

MONTH_____ 193____

Bus No._____ Make_____ Lic. No._____ Driver_____ Date Beg._____ End_____

Speedometer Reading Beg._____ End_____

DAY	MILEAGE				NO. PUPILS TRANSPORTED								GAS, OIL AND GREASE						REPLACEMENT PARTS		LABOR		TIRES & TUBES		TOTAL COST
	1ST TRIP	2ND TRIP	3RD TRIP	EXTRA	1ST TRIP		2ND TRIP		3RD TRIP		EXTRA		GAS GALS.	COST	OIL QTS.	COST	GRE. LBS.	COST	ITEM	COST	HRS.	COST	ITEM	COST	
					H.S.	ELEM.	H.S.	ELEM.	H.S.	ELEM.	H.S.	ELEM.													
1																									
2																									
3																									
19																									
20																									
Total																									

Ave. No. Pupils Transported Daily_____ Miles per gal. gas_____ Miles per quart oil_____

Remarks: _____

SIGNED: _____

ABOVE—SAMPLE PAGE FROM DRIVER'S REPORT BOOKLET

On the basis of information contained in these forms, each school principal prepares a monthly operating record for the county superintendent and the state school commission which includes the monthly totals on each of the above items for each of the reporting drivers

pairs are made, and the number of replacement buses needed is determined. Both elementary and high school students, white and colored, are transported. The white and the colored children, however, are transported in separate buses to separate schools.

Organization

North Carolina has 100 counties. Each county is an administrative unit for the public schools. The State School Commission administers the funds for all public school purposes and makes a monthly certification of funds to each administrative unit on a basis of its need. Each of the administrative units is allotted funds for transportation on exactly the same basis. Drivers and mechanics have the same wage scale all over the state. All buses are painted the same color and can be recognized wherever seen. Replacement buses are allotted on a basis of the percentage of the total number of buses in the county, and further in accordance with their need. The operating cost of transportation has been considerably reduced since it has been handled by the state with a central agency, and at the same time the service to the children of the state has been considerably extended.

It is easy to understand from the foregoing statements that rural school organization and transportation go hand in hand; and consequently, in the routing of buses or the locating of a new school building, the route can be laid out and the building can be located according to the needs of the particular territory, taking into consideration the population, the available roads, and the need for an elementary or a high school building, or both. Our people are constantly demand-

SCHOOL BUS INSPECTION REPORT

(Sec. 28, 1933 School Machinery Act)

_____ County

Name of School	Bus No.	Make	Model	Motor No.	Name of Driver	Age of Driver

To the County Board of Education of _____ County.

This is to certify that I have this day made a careful inspection of the school bus described above and make a report as follows:

A—CHASSIS:

1. Speedometer reading _____
2. Steering mechanism complete _____
3. Brakes (a) Foot _____
   (b) Emergency _____
4. Wheels (alignment, bearings, lugs, etc.) _____
5. Tires _____
6. Motor _____
7. Greasing (transmission, differential, general) _____
8. Remarks on Chassis: _____

B—BODY:

1. Sills and woodwork _____
2. Glass _____
3. Door controls _____
4. Step _____
5. Windshield wiper _____
6. Rear view mirror _____
7. Top _____
8. Remarks on Body: _____

Certified, This the _____ day of _____ 193____

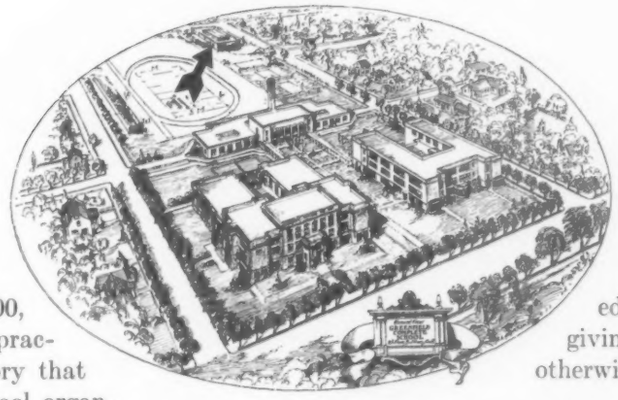
_____ Inspecting Mechanic

Form to Be Filled Out by Inspecting Mechanic and Filed with County Board of Education

ing more vocational training, and transportation makes it possible to bring most of the students to schools large enough to offer vocational subjects.

Good rural school organization is absolutely dependent on transportation. By avoiding unnecessary duplication of bus routes, by elimination of unauthorized use of school buses, by constant supervision of maintenance and servicing of buses, and by centralized purchasing, the state is enabled to approach an almost irreducible minimum of cost, thereby insuring a larger percentage of the school dollar to be allocated to instructional service costs.

EFFICIENT, SAFE TRANSPORTATION SERVICE ESSENTIAL TO SUCCESSFUL CONSOLIDATION OF RURAL SCHOOLS



THE Greenfield School District, consisting of 100 square miles of fertile farming land in southern Ohio, with the progressive manufacturing city of Greenfield, population 5,000, as its center, embodies a practical application of the theory that the ideal basis for rural school organization is the trade center with its adjacent land; ideal from the standpoints of population, cohesion, community of interests, and intellectual and business contacts.

A Pioneer in Consolidation

After the completion of the high-school building in Greenfield, in 1914, a concentrated effort was made to induce the outlying school districts to take advantage of the opportunities offered by the Greenfield schools. As a result, all the surrounding territory petitioned for annexation, and the Greenfield Exempted Village School District was formed. In taking this step, Greenfield was one of the pioneers in using consolidation of schools as a means of providing a lower cost of education per pupil, as well as giving educational advantages not otherwise available.

New Buildings

When the district was formed, the school began to grow in numbers, and it became evident that additional facilities were necessary. So, to the original high school were added a vocational building and an elementary school. Following the construction of these buildings, the district acquired eight acres directly north of the school group, at that time largely covered by dwellings. The buildings were removed, and an athletic field was constructed. In designing the field, a section at the northeast corner was set aside for a garage building.

Two Views of the Garage. The Position of This Building in the School Group Is Marked by an Arrow in the Drawing Above

Transportation Service

With consolidation, it became necessary to bring all the children in the outlying territory to school every morning and return them to their homes each evening. It was decided that the best way to handle this problem was to own and operate a fleet of school buses. This method has been followed from the beginning and has proved both economical and satisfactory.

When the garage building was opened for use at the beginning of the 1935-1936 school year, it was possible to organize the transportation department on an efficient basis. A garage superintendent and mechanic is employed on full-time service. It is his duty to maintain the buses in first-class operating condition, keep a careful check on all material and supplies that pass through his department, and also act as a driver during the school year of nine months. During the summer all buses are completely overhauled, put in the best possible state of repair, and repainted when necessary.

It requires 18 buses to transport the 700 children. A driver is employed for each bus for the time required. Before the opening of the school year, the drivers go over their routes and make a tentative list of pupils in the territory, and as soon as the routes are definitely fixed, each driver must fill out a form for the superintendent, giving the age, grade and teacher of each child, and the time and place where each is picked up. Every week a form must be filled out showing the driver's schedule for the preceding week, the names of new children on his route, the names of children who have removed to other routes or have left the district, accidents that have occurred, cases of serious misbehavior, etc.

Each driver is under $200 bond. The manual giving complete instructions for drivers stresses the necessity for seeing that buses are in safe condition before being taken out, and defines the drivers' status as respects caring for the children and maintaining order in the buses. Drivers are privileged to cut the deportment grades of pupils whose conduct warrants it, on the deportment form which must be filled out and submitted at the end of each month.

The safety precautions in force in this transportation system have been effective. During the operation of the buses by the school, more than 3,500,000 pupil-trips have been made, with not a single pupil injured in a bus accident, and only one injured, not seriously, after leaving the bus.

NOTE: This article was prepared from material furnished by the Greenfield Schools.

Significant Items of School Transportation Expense*

IN speaking of the cost of a given service, the quality and quantity of service rendered obviously should be taken into consideration. There is no way in which to answer satisfactorily a general question such as "What is the cost of an adequate and efficient system of bus transportation?" Even the same service in different communities will not be likely to cost the same. The elements that enter into such costs should, however, be standardized for obvious reasons.

The following classification of costs is suggested as significant and adequate for cost studies and financial records of current expenditures for pupil transportation:

(1) **Variable Charges:** Items of expense which vary according to the number of miles the truck is operated:

a. Cost of gasoline
b. Cost of lubricants—cylinder oil and grease
c. Cost of tires and tire repairs
d. Cost of maintenance—labor and materials
e. Supplies
f. Miscellaneous services
g. Possible depreciation costs based on mileage

(2) **Fixed Charges:** Items of expense which do not vary according to the extent to which a truck is used:

a. Wages of drivers and supervisors of transportation
b. Insurance: **Truck**—hail, wind, tornado, fire (not theft)
Liability—Employer's liability for injury to bus drivers; no other liability insurance should be purchased to anticipate transportation hazards unless authorized by statute or by the courts
c. Other fixed cost: garage rent, license fees
d. Administration: allocation of general administration expenses properly chargeable to bus service

Such a classification of costs, it will be noted, is not patterned after the standard character classification commonly used in general school accounting forms. However, there is no particular advantage in having a standard classification by character of bus transportation costs for cost finding purposes.

* Excerpts from a paper by I. O. Friswold, Director, Division of Buildings and Business Administration, Minnesota State Department of Education. Reprinted by permission from the Proceedings of the Twenty-Fifth Annual Meeting of the National Association of Public School Business Officials.

AUTOFYRSTOP COMPANY

Merchant & Evans Co.

2035 Washington Ave., Philadelphia, Pa.

AUTOMATIC AND MANUAL FIRE ALARM-EXTINGUISHER

DEVICES AUTOFYRSTOP SYSTEMS

For School and University Buildings, Residences, Dormitories, Laboratories Storage, School Bus Transportation

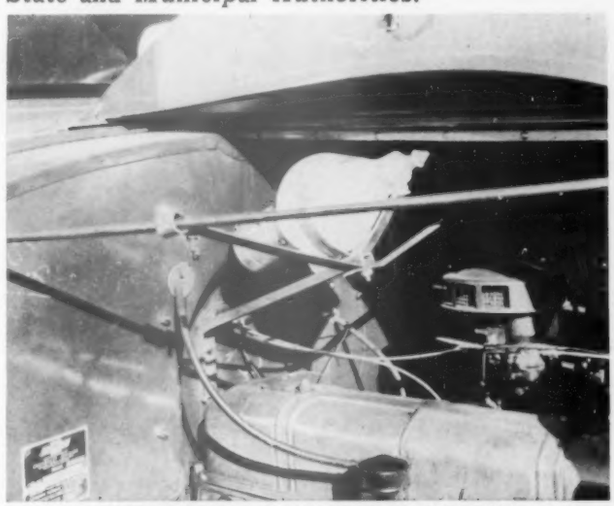
"Approved" by Underwriters' Laboratories, Inc., and "Listed" under "Signal & Watch Service Appliances" in "List of Inspected Fire Protection Appliances." (Copy on request.)
Included in National Board of Fire Underwriters' "Advice" under National Fire Protection Association "Recommendation," and endorsed by various Official State and Municipal Authorities.

STANDARD IN NORTH CAROLINA

When the North Carolina School Board considered the danger to which the millions of school children carried in their thousands of school buses throughout the school year might be subjected in case of fire they concluded at once that protection against fire on their buses—under any possible emergency of road operation—must be provided.

When the Board considered the type of fire protective equipment which would give the greatest protection to the children under their charge they chose AutoFYRstop—Because:

¶AutoFYRstop is Automatic in action and can also be Manually used either by hurling entire bottle or by cracking off special tip seal and sprinkling.
¶It is "CareFree" and "EverReady," sturdy in construction, sure in action and cannot leak or be robbed, or get out of order, immune from freezing.
¶Has record of 93% effective fire protection.
¶Its construction and mechanism is "Approved" by Underwriters' Laboratories.
¶It is recommended by many State and Municipal Fire Authorities.

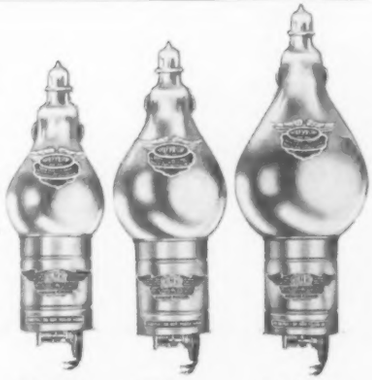


UNDER-HOOD AUTOMATIC ASSEMBLY
For Car, Bus, Truck and Power Boat
Installation of III-B-36 AutoFYRstop Automatic unit on 1½ ton Chevrolet School Bus—set with 212° F. fuse. *Note* Shock-proof central position

B MODELS

Automatic and Manual
(Electric switch optional extra)

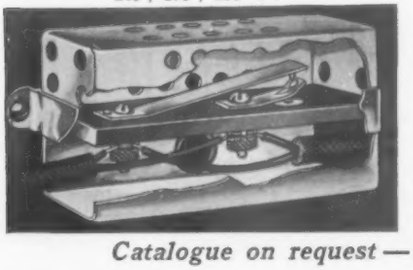
AutoFYRstop Automatic models with electric switches for wiring in circuit alone or in combination with AutoReseT Detectors in Central Alarm System—also manually usable.



V B-14 IV B-24 III B-36

STEERING POST ASSEMBLY
Illustrating method of attaching 14 oz. and/or 17 oz. AutoFYRstop Manual Devices to steering post. At hand for instant use
Made in 14 oz., 17 oz., 24 oz., and 36 oz. sizes

AUTORESET THERMOSTAT FIRE-DETECTOR
140°, 175°, 250° F.



Wired alone or in combination with AutoFYRstop Automatic devices in central Fire Alarm System suitable for School and College or other building groups.

AutoFYRstop Fire Alarm-Extinguisher Equipment for Schools Approved in Pennsylvania

The laws of Pennsylvania regarding Fire Control are among the most progressive and efficient of any of the States of the U. S.

AutoFYRstop **AutoReseT** Fire Alarm Systems are "Approved" by the Department of Labor and Industry of Pennsylvania, for unsupervised, "B" Class, Systems applicable for Schools, Colleges and Institutions.

Eligible for F.H.A. Loans Title I.

With AutoFYRstop Alarm-Extinguisher devices the AutoReseT provides a highly efficient, low priced Alarm-Extinguisher System especially suited to School Buildings.

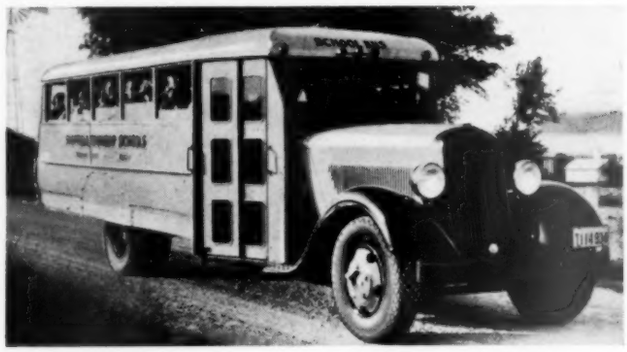
Catalogue on request — Inquiries invited — Submit your problems for our estimates

THE GOODYEAR TIRE & RUBBER CO., INC.

World's Largest Rubber Manufacturers

Akron, Ohio

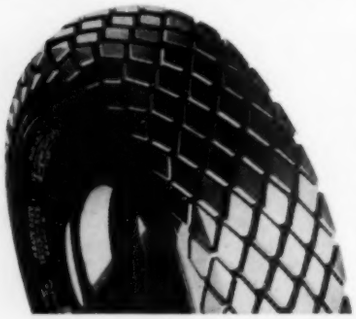
ON YOUR OWN OR ON CONTRACT EQUIPMENT, INSIST UPON GOODYEAR TIRES AND TUBES FOR YOUR SCHOOL BUSSES



THEY'RE SAFE—LONG-LASTING

Safety is the prime requisite for school bus tires. Let the tires fail—by blowout—by lack of grip in dangerous going or emergency stops—and serious consequences may result.

In the Goodyear All-Weather Tires and the Lifeguard * Tube, Goodyear has made two important contributions to school bus operation.



Goodyear Tires are built to provide maximum safety inside and out; that is, against blowout—against skidding.

Only Goodyear Tires are built with pre-shrunk Supertwist Cord. Supertwist has greater resiliency than ordinary cord and for this reason is able to withstand the extreme heat and wear under the rapid flexing of cords when the tire is in motion.

The tread is scientifically designed for maximum grip, non-skid safety and long wear. It has deep, tough, gripping edges that provide quick stopping for emergencies—safe traction on wet, slippery or muddy roads.

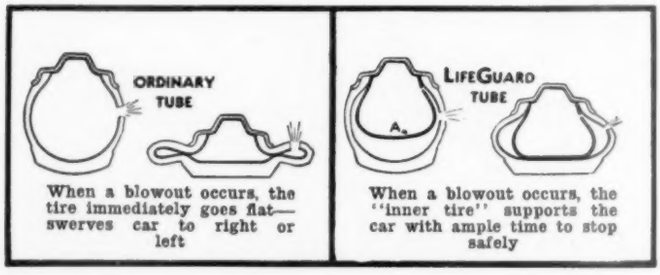
Both treads and body are made of a special chemically-toughened, heat-resisting rubber. These features make Goodyear Tires unusually safe, long-lasting, economical.

Goodyear invites comparison, point by point, and any Goodyear dealer will be glad to demonstrate why we suggest that you insist upon Goodyear Tires for your school busses—whether your own or contract equipment.

THE GOODYEAR LIFEGUARD * TUBE

This new tube is the last word in school bus safety. It converts the effect of a blowout to that of a slow leak. It is really a tire within a tire. Should a blowout occur and the outer "tire" split wide open, the inner "tire" enables the driver to bring his bus to a slow deliberate stop under full control.

* Trade-Mark Registered.


ORDINARY TUBE
When a blowout occurs, the tire immediately goes flat—swerves car to right or left
LIFEGUARD TUBE
When a blowout occurs, the "inner tire" supports the car with ample time to stop safely

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)

606 So. Michigan Ave. Chicago, Illinois

Insist on INTERNATIONAL SCHOOL BUSES

They're SAFE
They're ECONOMICAL
They're DEPENDABLE

The outstanding performance of Internationals in school transportation is evidenced by the ever-increasing number of schools using them

The importance of **safety, economy,** and **dependability** in school transportation cannot be emphasized too strongly. In building school bus chassis, International Harvester is guided by these fundamentals. The International bus chassis combines sound design, sturdy construction, and modern mechanical refinements to provide **safe transportation** at **low cost.**

International builds chassis that are as safe as human ingenuity, modern engineering, and careful workmanship can make them

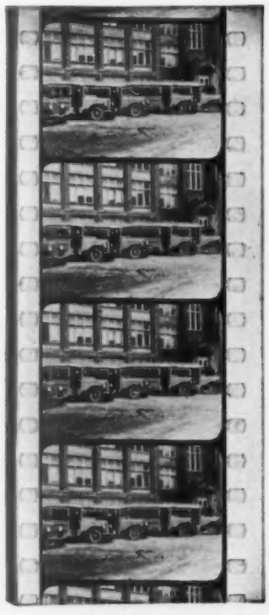
Western Kentucky Teachers College provides comfortable transportation with this long-wheelbase Model C-40 International and attractive body

School bus requirements vary with road conditions, length of routes, and the number of children to be carried. International chassis are available in a wide range of sizes and wheelbases to meet the many different school-transportation needs.

Before you invest in buses, or award contracts, make a careful study of the market—you will readily see why so many school boards insist that the children in their care ride in Internationals. More than 30 years of experience in the manufacture of quality automotive units is back of Internationals. Service is provided by 230 Company-owned branches and service stations, and thousands of International dealers.

Write for Film on School Transportation

This interesting and educational one-reel sound motion picture offers many suggestions for more efficient school transportation. It is available for showing to all interested in this important subject. Write us for it and we will arrange to have our nearby branch show it to you. Also ask us for the booklet "New Routes to School Bus Economy," and for the "School Bus Cost Record"—a simple method of keeping costs on school bus operation and maintenance.



PENN YAN BODIES

Penn Yan, New York

Announcing
The "PENN YAN" School Bus for 1937

The 1937 "PENN YAN" school buses are a special type of construction of exceptional quality, inherent structural strength and detailed finish. They are sanely engineered for safety and durability.

Distinctive appearance is created by modern streamlined styling, adapted to a construction that has been used by us for many years and has therefore had its durability proved under all conditions of road and terrain.

The "PENN YAN" school buses are a credit in every respect to the highest standards of custom body construction. They are the result of the most perfect blending of engineering and artistry to be found in any motor coach built today. Down to the last small detail, the 1937 "PENN YAN" school bus furnishes a new standard by which all other buses might be measured—for safety, for comfort and individuality.

"BUILT TO A STANDARD AND NOT TO A PRICE," "PENN YAN" school buses are delivered completely equipped with all appointments. They have the most flawless execution of interior styling ever found in a school bus, which helps to make this new "PENN YAN" the ultimate in pupil transportation.

Whether your requirements call for 31 or 61 passengers, you will find a "PENN YAN" school bus to meet your most exacting conditions. Various capacities are available consisting of 31, 37, 43, 49, 55 and 61-passenger buses. They can be mounted on any make of chassis selected, provided they meet the requirements of your State Board of Education and Public Service Commission.

"SERVICE" is the keynote of our success. Therefore for a number of years, we have maintained a service car, virtually a factory on wheels, thoroughly equipped to re-paint buses and make minor repairs to them on your premises. The cost is relatively low as we consider this service part of our obligation and willingly cooperate by adjusting our time and service work to suit your convenience as much as possible.

In the interest of humanity, Penn Yan engineers have called upon all their resources to make this, "The Penn Yan," the safest and most healthful School Bus ever offered for pupil transportation.

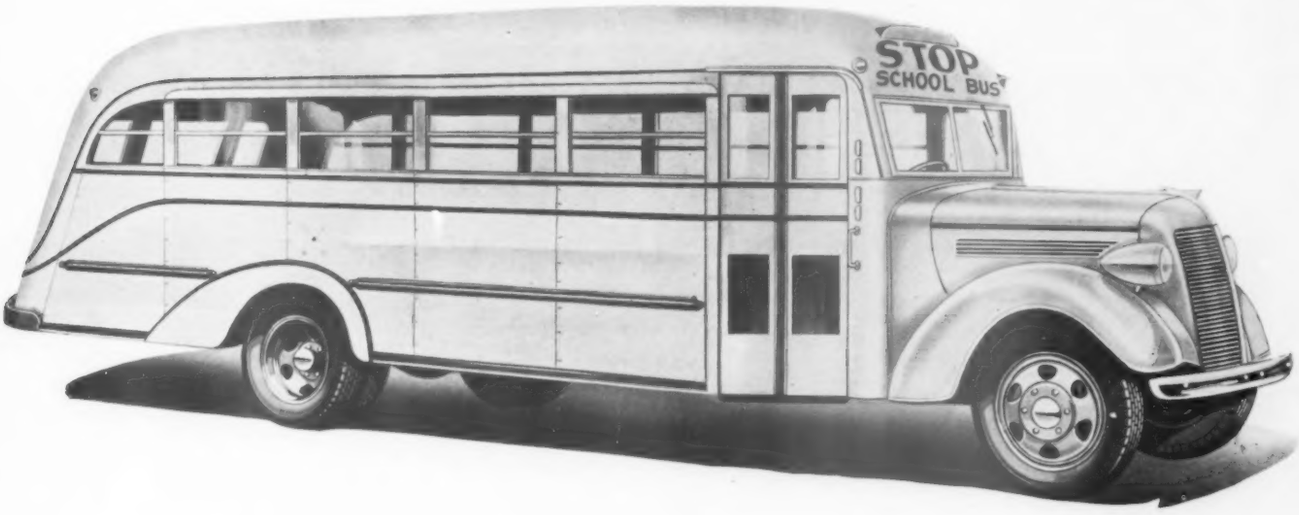
Experienced School Boards now insist that their most valuable assets, "The Children," be transferred in the safest, most healthful school bus obtainable. Penn Yan School Buses now carry, annually, in New York State, over seven million school children, a trust we cherish highly. We invite you to see our demonstrators which are available by the leading bus chassis manufacturers; ride in them and see for yourself why "Penn Yan" School Buses are symbolical with safe and sane pupil transportation.

SUPERIOR BODY COMPANY

Lima, Ohio

Pioneer Builders of All-Steel Safety School Bus Bodies

DISTRIBUTORS IN PRINCIPAL CITIES



5 IMPORTANT FEATURES

FOUND IN SUPERIOR ALL-STEEL SAFETY SCHOOL BUS BODIES

ALTHOUGH safety is a first consideration in bus transportation, there are other major considerations. Superior pioneered the building of all-steel safety school buses and after years of all-steel construction, Superior now offers a school bus body so constructed and insulated as to absolutely eliminate rattle and rumble and also properly insulated against heat, cold and fumes. Comfort, the riding quality of the bus, seat comfort, proper ventilation—all of these are of prime importance, and in Superior All-Steel Safety School Bus Bodies no detail of this character has been overlooked.

- **SAFETY**
- **HEALTH**
- **APPEARANCE**
- **COMFORT**
- **ECONOMY**

And no lack of "roominess" has resulted from the modernized, stream lines which contribute so much to good styling and pride of ownership.

Finally, Superior All-Steel Safety School Bus Bodies not only provide safety and comfort and good appearance, but they do it ECONOMICALLY. A surprisingly reasonable first cost goes hand in hand with unequalled low cost of operation and maintenance, and a stubborn resistance to depreciation. It is upon this platform that Superior is elected by far-thinking and conservative buyers upon whom selection and ultimate responsibility rest.

Superior All-Steel Safety School Bus Bodies are made in five lengths, two widths and a wide choice of seating arrangements. Write for completely descriptive and illustrated literature.

SECTION XI
COLLEGE, UNIVERSITY AND NORMAL SCHOOL PRESIDENTS

(Normal school principals are designated by an asterisk.)

City	Institution	President
Alabama		
Athens	Athens College for Young Women	E. R. Naylor
Auburn	Alabama Polytechnic Institute	L. N. Duncan
Birmingham	Birmingham-Southern College	Guy E. Snavely
Birmingham	Howard College	T. V. Neal
Daphne	State Normal School	D. R. Murphy
Florence	State Teachers College	H. J. Willingham
Jacksonville	State Teachers College	C. W. Daugette
Livingston	State Teachers College	G. W. Brock
Marion	Judson College	L. G. Cleverdon
Montevallo	Alabama College	A. F. Harman
Montgomery	Huntingdon College	Walter D. Agnew
Montgomery	State Teachers College	H. C. Trenholm
Normal	State Agricultural & Mechanical Institute	J. F. Drake
Selma	Selma University	Wm. H. Dinkins
Spring Hill	Spring Hill College	John J. Druhan
Talladega	Talladega College	Buell G. Gallagher
Troy	State Teachers College	M. D. Pace
Tuskegee Institute	Tuskegee Institute	F. D. Patterson
University	University of Alabama	Richard C. Foster
Arizona		
Flagstaff	Arizona State Teachers College	Thomas J. Tormey
Tempe	Arizona State Teachers College	Grady Gammage
Tucson	University of Arizona	Paul Steere Burgess
Arkansas		
Arkadelphia	Henderson State Teachers College	J. P. Womack
Arkadelphia	Ouachita College	James R. Grant
Batesville	Arkansas College	W. S. Lacy
Clarksville	The College of the Ozarks	Wiley Lin Hurie
Conway	Arkansas State Teachers College	H. L. McAlister
Conway	Hendrix College	J. H. Reynolds
Fayetteville	University of Arkansas	John C. Futrall
Jonesboro	Arkansas State College	V. C. Kays
Little Rock	Arkansas Baptist College	Sidney R. Tillinghast
Little Rock	Philander Smith College	M. LaF. Harris
North Little Rock	Shorter College	G. Archie Gregg
Pine Bluff	Agricultural, Mechanical and Normal College	John B. Watson
Searcy	Harding College	George S. Benson
Siloam Springs	John Brown University	John E. Brown
California		
Angwin	Pacific Union College	Walter I. Smith
Arcata	Humboldt State College	Arthur S. Gist
Berkeley	Pacific School of Religion	H. F. Swartz
Berkeley	University of California	Robert G. Sproul
Chico	State College	A. J. Hamilton
Claremont	Claremont Colleges	William S. Ament, Acting
Claremont	Pomona College	C. K. Edmunds
Claremont	Scripps College	Ernest J. Jaqua
Fresno	State College	F. W. Thomas
La Verne	La Verne College	Ellis M. Studebaker
Los Angeles	Chapman College	Cecil F. Cheverton
Los Angeles	College of Medical Evangelists	Percy T. Magan
Los Angeles	College of Osteopathic Physicians and Surgeons	Carle H. Phinney
Los Angeles	Loyola University of Los Angeles	Hugh M. Duce
Los Angeles	Mount St. Mary's College	Sister Margaret Mary
Los Angeles	Occidental College	Remsen D. Bird
Los Angeles	University of California at Los Angeles	Ernest C. Moore, Provost
Los Angeles	University of Southern California	R. B. von KleinSmid
Oakland	College of the Holy Names	Mother Mary Redempta
Oakland	Mills College	A. H. Reinhardt
Pasadena	California Institute of Technology	Robert A. Millikan, Ch. Exec. Council
Pasadena	Pasadena College	H. Orton Wiley
Redlands	University of Redlands	Clarence Howe Thurber
St. Mary's College	St. Mary's College	Brother Albert
San Diego	San Diego State College	Walter R. Hepner
San Francisco	San Francisco College for Women	Mother Eleanor Deming
San Francisco	State College	Alex. C. Roberts
San Francisco	University of San Francisco	Harold E. Ring
San Jose	State College	T. W. MacQuarrie
San Rafael	Dominican College of San Rafael	Sister Mary Thomas
Santa Barbara	State College	Clarence L. Phelps
Santa Clara	University of Santa Clara	Louis C. Rudolph
Stanford Univ.	Stanford University	Ray Lyman Wilbur
Stockton	College of the Pacific	Tully C. Knoles
Whittier	Whittier College	W. O. Mendenhall
Colorado		
Alamosa	Adams State Teachers College	Ira Richardson
Boulder	University of Colorado	George Norlin
Colorado Springs	The Colorado College	Thurston J. Davies
Denver	Regis College	R. M. Kelley
Denver	University of Denver	D. Shaw Duncan
Fort Collins	Colorado State College of Agriculture and Mechanic Arts	Charles A. Lory
Golden	Colorado School of Mines	M. F. Coolbaugh
Greeley	Colorado State College of Education	G. W. Frasier
Gunnison	Western State College of Colorado	C. C. Casey
Loretto	Loretto Heights College	Mother Ann Frances
Connecticut		
Danbury	State Normal College	Ralph C. Jenkins*
Hartford	Hartford Theological Seminary	Rockwell H. Potter, Dean
Hartford	Trinity College	Remsen B. Ogilby
Middletown	Wesleyan University	J. L. McConaughy
New Britain	Teachers College of Connecticut	Herbert D. Welte*
New Haven	Albertus Magnus College	Sister Anacletus
New Haven	Arnold College for Hygiene and Physical Education	Webster Stover
New Haven	Berkeley Divinity School	Wm. P. Ladd, Dean
New Haven	Connecticut College of Pharmacy	Curtis P. Gladding
New Haven	State Normal School	F. E. Engleman*
New Haven	Yale University	James R. Angell
New London	Connecticut College	Katharine Blunt
New London	United States Coast Guard Academy	E. D. Jones, Supt.
Storrs	Connecticut State College	Albert N. Jorgensen
West Hartford	St. Joseph College	Mother Maria Francis
Willimantic	State Normal School	George H. Shafer*
Delaware		
Dover	State College for Colored Students	R. S. Grossley
Newark	University of Delaware	Walter Hullihen
District of Columbia		
Washington	The American University	Joseph M. M. Gray, Chancellor
Washington	Catholic University of America	Joseph M. Corrigan
Washington	Gallaudet College	Percival Hall
Washington	Georgetown University	Arthur A. O'Leary

City	Institution	President
Washington	George Washington University	Cloyd Heck Marvin
Washington	Howard University	M. W. Johnson
Washington	National University	Charles S. Hatfield, Chancellor
Washington	Trinity College	Sister Berchmans Julia
Washington	Washington Missionary College	B. G. Wilkinson
Washington	Wilson Teachers College	Edgar C. Higbie

Florida

Coral Gables	University of Miami	B. F. Ashe
Daytona Beach	Bethune-Cookman College	Mary McLeod Bethune
Deland	John B. Stetson University	Wm. Sims Allen
Gainesville	University of Florida	John J. Tigert
Lakeland	Florida Southern College	Ludd M. Spivey
Tallahassee	Florida Agricultural & Mechanical College	J. R. E. Lee
Tallahassee	Florida State College for Women	Edward Conradi
Tampa	University of Tampa	John H. Sherman
Winter Park	Rollins College	Hamilton Holt

Georgia

Albany	Georgia Normal and Agricultural College	J. W. Holley
Americus	Georgia Southwestern College	Peyton Jacob
Athens	University of Georgia	Harmon White Caldwell
Atlanta	Atlanta-Southern Dental College	S. W. Foster
Atlanta	Atlanta University	Florence M. Read, Acting
Atlanta	Clark University	M. S. Davage
Atlanta	Emory University	Harvey W. Cox
Atlanta	Georgia School of Technology	Marion L. Brittain
Atlanta	Morehouse College	S. H. Archer
Atlanta	Morris Brown College	W. A. Fountain, Jr.
Atlanta	Spelman College	Florence M. Read
Augusta	Paine College	E. C. Peters
Decatur	Agnes Scott College	James R. McCain
Demorest	Piedmont College	George C. Billingrath
Forsyth	Bessie Tift College	Aquila Chamlee
Gainesville	Brenau College	H. J. Pearce
La Grange	La Grange College	W. E. Thompson
Macon	Mercer University	Spright Dowell
Macon	Wesleyan College	Dice R. Anderson
Milledgeville	Georgia State College for Women	Guy H. Wells
Mount Berry	Berry College	Martha Berry
Oglethorpe University	Oglethorpe University	Thornwell Jacobs
Rome	Shorter College	Paul M. Cousins
Savannah	Georgia State College	B. F. Hubert
Statesboro	South Georgia Teachers College	M. S. Pittman
Valdosta	Georgia State Woman's College	Frank R. Reade

Idaho

Albion	Albion State Normal School	R. H. Snyder
Caldwell	The College of Idaho	Orma J. Smith, Acting
Lewiston	Lewiston State Normal School	J. E. Turner
Moscow	University of Idaho	M. G. Neale
Nampa	Northwest Nazarene College	Russell V. DeLong
Wesleyan	Gooding College	W. E. Shaw

Illinois

Alton	Shurtleff College	P. L. Thompson
Aurora	Aurora College	Theodore Pierson Stephens
Bloomington	Illinois Wesleyan University	Harry Wright McPherson
Bourbonnais	St. Viator College	E. V. Cardinal
Carbondale	Southern Illinois State Normal University	Roscoe Pulliam
Carthage	Carthage College	Rudolph G. Schulz
Charleston	Eastern Illinois State Teachers College	Robert G. Buzzard
Chicago	Armour Institute of Technology	Willard E. Hotchkiss
Chicago	Central Y. M. C. A. College	Edward J. Sparling
Chicago	Chicago College of Osteopathy	Harry L. Collins
Chicago	Chicago Normal College	Verne O. Graham
Chicago	De Paul University	Michael J. O'Connell
Chicago	Lewis Institute	D. C. Jackson, Jr.
Chicago	Loyola University	Samuel K. Wilson
Chicago	Mundelein College	Sister M. Consuela
Chicago	Pestalozzi Froebel Teachers College	Herman H. Hegner
Chicago	St. Xavier College for Women	Sister Mary G. Crane
Chicago	The Chicago Theological Seminary	Albert W. Palmer
Chicago	The University of Chicago	Robert M. Hutchins
Decatur	James Millikin University	John C. Hessler
De Kalb	Northern Illinois State Teachers College	Karl L. Adams
Elsah	The Principia	Frederic E. Morgan
Elmhurst	Elmhurst College	Timothy Lehmann
Eureka	Eureka College	Raymond F. McLain
Evanston	National College of Education	Edna Dean Baker
Evanston	Northwestern University	Walter Dill Scott
Galesburg	Knox College	Carter Davidson
Greenville	Greenville College	H. J. Long
Jacksonville	Illinois College	Harold C. Jaquith
Jacksonville	MacMurray College	C. P. McClelland
Joliet	College of St. Francis	Mother M. Thomasine
Lake Forest	Lake Forest College	H. McComb Moore
Lebanon	McKendree College	C. R. Yost
Lisle	St. Procopius College	Valentine Kohlbeck
Macomb	Western Illinois State Teachers College	W. P. Morgan
Monmouth	Monmouth College	James H. Grier
Mundelein	St. Mary of the Lake Seminary	Reynold Hillenbrand
Naperville	North Central College	Edward E. Rall
Normal	Illinois State Normal University	R. W. Fairchild
Peoria	Bradley Polytechnic Institute	F. R. Hamilton
Peru	St. Bede College	Justus Wirth
Quincy	Quincy College	John B. Koebele
River Forest	Rosary College	Sister Thomas Aquinas
Rockford	Rockford College	Gordon Keith Chalmers
Rock Island	Augustana College and Theological Seminary	Conrad Bergendoff
Urbana	University of Illinois	A. C. Willard
Wheaton	Wheaton College	J. O. Buswell, Jr.

Indiana

Bloomington	Indiana University	William L. Bryan
Crawfordsville	Wabash College	Louis B. Hopkins
Danville	Central Normal College	Carl H. Griffey
Evansville	Evansville College	F. Marion Smith
Franklin	Franklin College	Wm. Gear Spencer
Goshen	Goshen College	Sanford C. Yoder
Greencastle	DePauw University	Clyde E. Wildman
Hanover	Hanover College	A. G. Parker, Jr.
Huntington	Huntington College	Harold C. Mason
Indianapolis	Butler University	James W. Putnam
Indianapolis	Indiana Central College	I. J. Good
Indianapolis	Indianapolis College of Pharmacy	F. E. Bibbins
Indianapolis	Normal College of the American Gymnastic Union	Carl B. Sputh
Lafayette	Purdue University	Edward C. Elliott
Marion	Marion College	Wm. F. McConn
Muncie	Ball State Teachers College	L. A. Pittenger
N. Manchester	Manchester College	Otho Winger
Notre Dame	St. Mary's College	Sister M. Madeleva
Notre Dame	University of Notre Dame	John F. O'Hara
Oakland City	Oakland City College	W. P. Dearing
Richmond	Earlham College	William C. Dennis
St. Mary-of-the-Woods	St. Mary-of-the-Woods College	Mother Mary Raphael
Terre Haute	Indiana State Teachers College	Ralph N. Tirey
Terre Haute	Rose Polytechnic Institute	Donald B. Prentice
Upland	Taylor University	Robert Lee Stuart
Valparaiso	Valparaiso University	O. C. Kreinheder

Iowa

Ames	Iowa State College of Agriculture and Mechanic Arts	Charles E. Friley
Cedar Falls	Iowa State Teachers College	O. R. Latham
Cedar Rapids	Coe College	Harry M. Gage
Davenport	St. Ambrose College	Martin Cone
Decorah	Luther College	O. J. H. Preus
Des Moines	Des Moines College of Pharmacy	F. W. Fitch
Des Moines	Des Moines Still College of Osteopathy	A. B. Becker
Des Moines	Drake University	D. W. Morehouse
Dubuque	Clarke College	Sister Mary Antonia
Dubuque	Columbia College	Thomas Conry
Dubuque	University of Dubuque	Dale D. Welch
Fairfield	Parsons College	Clarence W. Greene
Fayette	Upper Iowa University	W. C. Mongold, Acting
Grinnell	Grinnell College	John S. Nollen
Indianola	Simpson College	Earl E. Harper
Iowa City	State University of Iowa	Eugene A. Gilmore
Le Mars	Western Union College	D. O. Kime
Mount Pleasant	Iowa Wesleyan College	Harry D. Henry
Mount Vernon	Cornell College	H. J. Burgstahler
Oskaloosa	William Penn College	F. W. Perisho, Dean
Pella	Central College	Irwin J. Lubbers
Sioux City	Morningside College	Earl A. Roadman
Sioux City	Trinity College	John A. Elbert
Storm Lake	Buena Vista College	Henry Olson
University Park	John Fletcher College	Charles W. Butler
Waverley	Wartburg College	E. J. Braulick

City	Institution	President
Kansas		
Atchison	Mt. St. Scholastica College	Mother Lucy Dooley
Atchison	St. Benedict's College	Martin Veth
Baldwin	Baker University	Nelson P. Horn
Bethel College	Bethel College	Ed. G. Kaufman
Emporia	College of Emporia	John Bailey Kelly
Emporia	Kansas State Teachers College	Thomas W. Butcher
Hays	Fort Hays Kansas State College	C. E. Rarick
Lawrence	University of Kansas	E. H. Lindley
Leavenworth	St. Mary College	Arthur M. Murphy
Lindsborg	Bethany College	Ernst F. Pihlblad
McPherson	McPherson College	V. F. Schwalm
Manhattan	Kansas State College of Agriculture and Applied Science	Francis D. Farrell
Ottawa	Ottawa University	Andrew B. Martin
Pittsburg	Kansas State Teachers College	W. A. Brandenburg
St. Marys	St. Mary's College	M. Germing
Salina	Kansas Wesleyan University	Larkin B. Bowers
Salina	Marymount College	Mother Rose Waller
Sterling	Sterling College	H. A. Kelsey
Topeka	Washburn College	Philip C. King
Wichita	Friends University	David M. Edwards
Wichita	Municipal University of Wichita	William M. Jardine
Winfield	Southwestern College	Frank E. Mossman
Kentucky		
Barbourville	Union College	John Owen Gross
Berea	Berea College	Wm. J. Hutchins
Bowling Green	Western Kentucky State Teachers College	H. H. Cherry
Danville	Centre College	James H. Hewlett, Acting
Frankfort	Kentucky State Industrial College	R. B. Atwood
Georgetown	Georgetown College	Henry Noble Sherwood
Lexington	Transylvania College	Arthur Braden
Lexington	University of Kentucky	Frank L. McVey
Louisville	Louisville College of Pharmacy	Rudolph V. Miersch
Louisville	Louisville Municipal College	Raymond A. Kent
Louisville	Nazareth College	Mother M. Catherine Malone
Louisville	Southern Baptist Theological Seminary	John R. Sampey
Louisville	University of Louisville	Raymond A. Kent
Morehead	Morehead State Teachers College	H. A. Babb
Murray	State Teachers College	James H. Richmond
Richmond	Eastern Kentucky State Teachers College	H. L. Donovan
Wilmore	Asbury College	E. T. Johnson, Exec. V. Pres.
Winchester	Kentucky Wesleyan College	R. V. Bennett
Louisiana		
Baton Rouge	Louisiana State University and Agricultural & Mechanical College	James M. Smith
Baton Rouge	Southern University and Agricultural and Mechanical College	J. S. Clark
Lafayette	Southwestern Louisiana Institute	Edwin L. Stephens
Natchitoches	Louisiana State Normal College	A. A. Fredericks
New Orleans	Dillard University	William S. Nelson
New Orleans	Loyola University	John W. Hynes
New Orleans	Newcomb Memorial College	Pierce Butler, Dean
New Orleans	St. Mary's Dominican College	Mother Mary Catherine
New Orleans	Tulane University of Louisiana	Robert L. Menuet, Acting
New Orleans	Ursuline College	Mother Mary B. Bonhomme
New Orleans	Xavier University	Mother M. Agatha
Pineville	Louisiana College	Claybrook Cottingham
Ruston	Louisiana Polytechnic Institute	E. S. Richardson
Shreveport	Centenary College	Pierce Cline
Maine		
Brunswick	Bowdoin College	Kenneth C. M. Sills
Castine	Eastern State Normal School	William D. Hall
Farmington	State Normal School	Wilbert G. Mallett
Fort Kent	Madawaska Training School	Richard F. Crocker*
Gorham	State Normal School	Walter E. Russell
Lewiston	Bates College	Clifton D. Gray
Machias	Washington State Normal School	Philip H. Kimball*
Orono	University of Maine	Arthur A. Hauck
Presque Isle	Aroostook State Normal School	San L. Merriman
Waterville	Colby College	Franklin W. Johnson
Maryland		
Annapolis	St. John's College	A. W. W. Woodcock
Annapolis	United States Naval Academy	David F. Sellers, Supt.
Baltimore	Goucher College	David A. Robertson
Baltimore	Johns Hopkins University	Isaiah Bowman
Baltimore	Loyola College	J. A. Canning
Baltimore	Milton College of Science & Arts	Wm. J. Heaps
Baltimore	Morgan College	John O. Spencer
Baltimore	College of Notre Dame of Maryland	Sister M. Frances
Baltimore	St. Mary's Seminary & University	John F. Fenlon
Bowie	Maryland Normal School	L. S. James
Chestertown	Washington College	Gilbert W. Mead
College Park	University of Maryland	H. C. Byrd
Emmitsburg	Mount St. Mary's College	John L. Sheridan, Acting
Emmitsburg	St. Joseph's College	Sister Paula Dunn
Frederick	Hood College	Henry I. Stahr
Frostburg	State Teachers College	John L. Dunkle*
Lutherville	Maryland College for Women	Frederick E. Metzger
Salisbury	State Teachers College	J. D. Blackwell
Towson	State Teachers College	Lida Lee Tall
Westminster	Western Maryland College	F. G. Holloway
Massachusetts		
Amherst	Amherst College	Stanley King
Amherst	Massachusetts State College	Hugh P. Baker
Boston	Boston University	Daniel L. Marsh
Boston	Emmanuel College	Sister Agnes Cecilia
Boston	Massachusetts College of Pharmacy	Theodore J. Bradley, Dean
Boston	Northeastern University	Frank P. Speare
Boston	Simmons College	Bancroft Beatley
Boston	Teachers College of the City of Boston	Wm. H. J. Kennedy
Bridgewater	State Teachers College	Zenos E. Scott
Cambridge	Harvard University	James B. Conant
Cambridge	Massachusetts Institute of Technology	Karl T. Compton
Cambridge	Radcliffe College	Ada L. Comstock
Chestnut Hill	Boston College	L. J. Gallagher
Fitchburg	State Teachers College	Charles M. Herlihy
Framingham	State Teachers College	M. F. O'Connor
Hyannis	State Teachers College	Herbert H. Howes
Lowell	Lowell Textile Institute	Charles H. Eames
Lowell	State Teachers College	James Dugan
Medford	Tufts College	John A. Cousens
Newton Center	Andover Newton Theological School	Everett C. Herrick
North Adams	State Teachers College	Albert G. Eldridge
Northampton	Smith College	William A. Neilson
Norton	Wheaton College	John Edgar Park
Salem	State Teachers College	J. Asbury Pitman
South Hadley	Mount Holyoke College	Roswell G. Ham, President-elect
South Lancaster	Atlantic Union College	G. Eric Jones
Springfield	American International College	C. S. McGown
Springfield	Springfield College	Ernest M. Best
Wellesley	Wellesley College	Mildred H. McAfee
Westfield	State Teachers College	Charles Russell
Weston	Regis College	Sister Genevieve Marie
Williamstown	Williams College	Tyler Dennett
Worcester	Clark University	Wallace W. Atwood
Worcester	College of the Holy Cross	Francis J. Dolan
Worcester	State Teachers College	Wm. B. Aspinwall
Worcester	Worcester Polytechnic Institute	Ralph Earle
Michigan		
Adrian	Adrian College	Harlan L. Feeman
Adrian	St. Joseph's College & Academy	Mother M. Gerald
Albion	Albion College	John L. Seaton
Alma	Alma College	Harry M. Crooks
Ann Arbor	University of Michigan	Alex. G. Ruthven
Battle Creek	Battle Creek College	Emil Leffler
Berrien Springs	Emmanuel Missionary College	Thomas W. Steen
Big Rapids	Ferris Institute	M. S. Ward
Detroit	Detroit College of Law	Wm. Krichbaum, Dean
Detroit	Detroit Institute of Technology	Paul Hickey
Detroit	Marygrove College	George H. Derry
Detroit	Sacred Heart Seminary	Daniel J. Ryan
Detroit	University of Detroit	A. H. Poetker
Detroit	Wayne University	Charles L. Spain, Exec. V. Pres.
East Lansing	Michigan State College of Agriculture and Applied Science	Robert S. Shaw
Grand Rapids	Calvin College	Ralph Stob
Hillsdale	Hillsdale College	Willfred Mauck

City	Institution	President
Holland	Hope College	Wynand Wichers
Houghton	Michigan College of Mining and Technology	Grover C. Dillman
Kalamazoo	Kalamazoo College	Stewart Grant Cole
Kalamazoo	Western State Teachers College	Paul V. Sangren
Marquette	Northern State Teachers College	Webster H. Pearce
Mt. Pleasant	Central State Teachers College	E. C. Warriner
Nazareth	Nazareth College	Sister M. Celestine
Olivet	Olivet College	Joseph Brewer
Ypsilanti	Michigan State Normal College	J. M. Munson

Minnesota

Bemidji	State Teachers College	M. W. Deputy
Collegeville	St. John's University	Alcuin Deutsch
Duluth	College of St. Scholastica	Mother M. Agnes Somers
Duluth	State Teachers College	E. W. Bohannon
Mankato	State Teachers College	Frank D. McElroy
Minneapolis	Augsburg College	George Sverdrup
Minneapolis	University of Minnesota	Lotus D. Coffman
Moorhead	Concordia College	J. N. Brown
Moorhead	State Teachers College	R. B. MacLean
New Ulm	Dr. Martin Luther College	Carl L. Schweppe
Northfield	Carleton College	Donald J. Cowling
Northfield	St. Olaf College	L. W. Boe
St. Cloud	State Teachers College	George A. Selke
St. Joseph	College of St. Benedict	Sister Rosamond
St. Paul	Bethel Institute	G. A. Hagstrom
St. Paul	College of St. Catherine	Sister Antonia
St. Paul	College of St. Thomas	James H. Moynihan
St. Paul	Hamline University	Charles N. Pace
St. Paul	Macalester College	John C. Acheson
St. Peter	Gustavus Adolphus College	O. J. Johnson
Winona	College of St. Teresa	Sister Mary A. Molloy
Winona	St. Mary's College	Brother Leopold
Winona	State Teachers College	Guy E. Maxwell

Mississippi

Alcorn	Agricultural & Mechanical College	Wm. H. Bell
Blue Mountain	Blue Mountain College	Lawrence T. Lowrey
Cleveland	Delta State Teachers College	W. M. Kethley
Clinton	Mississippi College	D. M. Nelson
Columbus	Mississippi State College for Women	B. L. Parkinson
Hattiesburg	Mississippi Woman's College	W. E. Holcomb
Hattiesburg	State Teachers College	J. B. George
Holly Springs	Rust College	L. M. McCoy
Jackson	Belhaven College	G. T. Gillespie
Jackson	Jackson College	B. Baldwin Dansby
Jackson	Millsaps College	D. M. Key
State College	Mississippi State College	G. D. Humphrey
Tougaloo	Tougaloo College	Judson L. Cross
University	University of Mississippi	A. B. Butts, Chancellor

Missouri

Canton	Culver Stockton College	John H. Wood
Cape Girardeau	Southeast Missouri State Teachers College	Walter W. Parker
Columbia	University of Missouri	F. A. Middlebush
Fayette	Central College	Robert H. Ruff
Fulton	Westminster College	F. L. McCluer
Jefferson City	Lincoln University	C. W. Florence
Kansas City	Kansas City College of Osteopathy & Surgery	Geo. J. Conley
Kansas City	Kansas City-Western Dental College	R. J. Rinehart, Dean
Kansas City	Rockhurst College	Daniel H. Conway
Kansas City	Teachers College of Kansas City	G. W. Diemer
Kirksville	Kirksville College of Osteopathy & Surgery	Geo. M. Laughlin
Kirksville	Northeast Missouri State Teachers College	Eugene Fair
Liberty	William Jewell College	John F. Herget
Marshall	Missouri Valley College	George H. Mack
Maryville	Northwest Missouri State Teachers College	Uel W. Lamkin
Parkville	Park College	F. W. Hawley
St. Charles	Lindenwood College	John L. Roemer
St. Louis	Concordia Theological Seminary	L. Fuerbringer
St. Louis	Harris Teachers College	C. G. Vannest
St. Louis	Maryville College	Mother Mary Reid
St. Louis	St. Louis University	Robert S. Johnston
St. Louis	Stowe Teachers College	J. Arthur Turner
St. Louis	Washington University	George R. Throop, Chancellor
Springfield	Drury College	T. W. Nadal
Springfield	Southwest Missouri State Teachers College	Roy Ellis
Tarkio	Tarkio College	M. E. Collins
Warrensburg	Central Missouri State Teachers College	E. L. Hendricks
Webster Groves	Webster College	George F. Donovan

Montana

Billings	Eastern Montana State Normal School	L. B. McMullen
Bozeman	Montana State College	Alfred Atkinson
Butte	Montana School of Mines	Francis A. Thomson
Dillon	Montana State Normal College	Sheldon E. Davis
Helena	Carroll College	Emmet Riley
Missoula	Montana State University	George F. Simmons
Polytechnic	Billings Polytechnic Institute	Ernest T. Eaton

Nebraska

Blair	Dana College	C. H. Hansen
Central City	Nebraska Central College	O. W. Carrell
Chadron	Nebraska State Normal College	Robert I. Elliott
Crete	Doane College	J. E. Taylor, Acting
Fremont	Midland College	H. F. Martin
Hastings	Hastings College	J. W. Creighton
Kearney	State Teachers College	Herbert L. Cushing
Lincoln	Nebraska Wesleyan University	E. Guy Cutshall
Lincoln	Union College	M. L. Andreasen
Lincoln	University of Nebraska	E. A. Burnett, Chancellor
Omaha	Creighton University	Patrick J. Mahan
Omaha	Municipal University of Omaha	Rowland Haynes
Peru	Peru State Teachers College	W. R. Pate
Seward	Concordia Teachers College	C. F. Brommer
Wayne	Nebraska State Teachers College	J. T. Anderson
York	York College	J. R. Overmiller

Nevada

Reno	University of Nevada	Walter E. Clark

New Hampshire

Durham	University of New Hampshire	Roy D. Hunter, Acting
Hanover	Dartmouth College	Ernest M. Hopkins
Keene	Keene Normal School	Wallace E. Mason
Manchester	St. Anselm College	Bertrand C. Dolan
Plymouth	Plymouth Normal School	Ernest L. Silver

New Jersey

Convent Station	College of St. Elizabeth	Sister Marie Jose Byrne, Dean
East Orange	Panzer College of Physical Education	Margaret C. Brown
East Orange	Upsala College	Carl G. Erickson
Glassboro	New Jersey State College	J. J. Savitz
Hoboken	Stevens Institute of Technology	Harvey N. Davis
Jersey City	St. Peter's College	Joseph S. Dinneen
Jersey City	State Normal School at Jersey City	Roy L. Shaffer
Lakewood	Georgian Court College	Mother M. Cecilia
Madison	Drew University	Arlo Ayres Brown
Montclair	New Jersey State Teachers College	Harry A. Sprague
Newark	Newark College of Engineering	Allan R. Cullimore
Newark	New Jersey State Normal School	M. Ernest Townsend
Newark	University of Newark	Frank Kingdon
New Brunswick	New Jersey College for Women	Margaret T. Corwin, Dean
New Brunswick	Rutgers University	Robert C. Clothier
Paterson	New Jersey State Normal School	Robert H. Morrison
Princeton	Princeton Theological Seminary	John A. Mackay
Princeton	Princeton University	Harold W. Dodds
Princeton	St. Joseph's College	Anthony Kieffer
South Orange	Seton Hall College	James Kelley
Trenton	State Teachers College	Roscoe L. West

New Mexico

Albuquerque	University of New Mexico	J. F. Zimmerman
El Rito	Spanish-American Normal School	Joseph B. Grant
Las Vegas	New Mexico Normal University	H. C. Gossard
Silver City	New Mexico State Teachers College	H. W. James
Socorro	New Mexico School of Mines	E. H. Wells
State College	New Mexico College of Agriculture & Mechanic Arts	Ray Fife

City	Institution	President
New York		
Albany	College of St. Rose	Edmund F. Gibbons
Albany	State College for Teachers	A. R. Brubacher
Alfred	Alfred University	J. Nelson Norwood
Annandale-on-Hudson	Bard College, Columbia University	Donald G. Tewksbury, Dean
Auburn	Auburn Theological Seminary	Harry Lathrop Reed
Aurora	Wells College	William E. Weld
Brockport	State Normal School	E. C. Hartwell
Bronxville	Sarah Lawrence College	Constance Warren
Brooklyn	Brooklyn College	William A. Boylan
Brooklyn	Long Island University	Tristram W. Metcalfe, Dean
Brooklyn	Polytechnic Institute of Brooklyn	Harry S. Rogers
Brooklyn	Saint Francis College	Brother Columba
Brooklyn	St. John's University	Edward J. Walsh
Brooklyn	St. Joseph's College for Women	Thomas E. Molloy
Buffalo	Canisius College	James P. Sweeney
Buffalo	D'Youville College	Sister Grace of the Sacred Heart
Buffalo	State Teachers College	Harry W. Rockwell
Buffalo	University of Buffalo	Samuel Paul Capen, Chancellor
Canton	St. Lawrence University	Laurens H. Seelye
Clinton	Hamilton College	Frederick C. Ferry
Cortland	Cortland Normal School	H. DeW. DeGroat*
Elmira	Elmira College	W. S. A. Pott
Fredonia	State Normal School	L. R. Gregory*
Garden City	Adelphi College	Frank D. Blodgett
Geneseo	State Normal School	James B. Welles
Geneva	Hobart & William Smith Colleges	William A. Eddy
Hamilton	Colgate University	George B. Cutten
Houghton	Houghton College	James S. Luckey
Ithaca	Cornell University	Livingston Farrand
Ithaca	Ithaca College	Leonard Bliss Job
Keuka Park	Keuka College	J. Hillis Miller
New Paltz	State Normal School	L. H. van den Berg
New Rochelle	College of New Rochelle	Cornelius Crowley
New York	Barnard College	Virginia C. Gildersleeve, Dean
New York	Biblical Seminary in New York	Wilbert W. White
New York	College of the City of New York	F. B. Robinson
New York	College of Mount St. Vincent	Sister Josephine Rosaire, Dean
New York	College of The Sacred Heart	Grace C. Dammann
New York	Columbia University	Nicholas M. Butler
New York	Cooper Union	Gano Dunn
New York	Fordham University	Robert I. Gannon
New York	General Theological Seminary	H. Fosbroke, Dean
New York	Hunter College of the City of N.Y.	Eugene A. Colligan
New York	Jewish Thelogical Seminary of America	Cyrus Adler
New York	Manhattan College	Brother Patrick
New York	New York Medical College	Claude A. Burrett, Dean
New York	New York University	Harry W. Chase, Chancellor
New York	Savage School for Physical Education	Ella W. Savage
New York	Teachers College, Columbia University	Wm. F. Russell, Dean
New York	Union Theological Seminary	Henry S. Coffin
New York	Yeshiva College	Bernard Revel
Niagara Univ.	Niagara University	Joseph M. Noonan
Oneonta	Hartwick College	Chas. W. Leitzell
Oneonta	State Normal School	Chas. W. Hunt*
Oswego	State Normal School	Ralph W. Swetman*
Plattsburgh	State Normal School	Charles C. Ward
Potsdam	Clarkson College of Technology	James Shelby Thomas
Potsdam	State Normal School	R. T. Congdon*
Poughkeepsie	Vassar College	H. N. MacCracken
Rochester	Nazareth College	Sister M. Sylvester
Rochester	The Colgate-Rochester Divinity School	Albert W. Beaven
Rochester	University of Rochester	Alan Valentine
St. Bonaventure	St. Bonaventure College	Thomas Plassmann
Saratoga Springs	Skidmore College	Henry T. Moore
Schenectady	Union College	Dixon Ryan Fox
Staten Island	Wagner Memorial Lutheran College	Clarence C. Stoughton
Syracuse	New York State College of Forestry	Samuel N. Spring, Dean
Syracuse	Syracuse City Normal School	Wm. W. Wright*
Syracuse	Syracuse University	W. P. Graham, Acting Chancellor
Tarrytown	Marymount College	Mother M. Gerard
Troy	Rensselaer Polytechnic Institute	Wm. O. Hotchkiss
Troy	Russell Sage College	J. L. Meader
West Point	United States Military Academy	W. D. Connor, Supt.
White Plains	Good Counsel College	Mother M. Aloysia

City	Institution	President
North Carolina		
Asheville	Asheville Normal & Teachers College	John E. Calfee
Boone	Appalachian State Teachers College	B. B. Dougherty
Chapel Hill	University of North Carolina	Frank P. Graham
Charlotte	Johnson C. Smith University	H. L. McCrorey
Charlotte	Queens-Chicora College	W. H. Frazer
Cullowhee	Western Carolina Teachers College	H. T. Hunter
Davidson	Davidson College	Walter L. Lingle
Durham	Duke University	Wm. Preston Few
Durham	North Carolina College for Negroes	James E. Shepard
Elizabeth City	State Normal School	J. H. Bias
Elon College	Elon College	Leon E. Smith
Fayetteville	State Normal School	J. W. Seabrook
Greensboro	Agricultural & Technical College	F. D. Bluford
Greensboro	Bennett College	David D. Jones
Greensboro	Greensboro College	Luther L. Gobbel
Greensboro	Woman's College of the University of North Carolina	W. C. Jackson, Dean
Greenville	East Carolina Teachers College	Leon R. Meadows
Guilford College	Guilford College	Clyde A. Milner
Hickory	Lenoir Rhyne College	P. E. Monroe
High Point	High Point College	G. I. Humphreys
Murfreesboro	Chowan College	R. K. McCulloch
Raleigh	Meredith College	Charles E. Brewer
Raleigh	North Carolina State College of Agriculture & Engineering, University of North Carolina	John W. Harrelson, Dean
Raleigh	St. Augustine's College	Edgar H. Goold
Raleigh	Shaw University	Robert P. Daniel
Red Springs	Flora MacDonald College	Henry G. Bedinger
Salisbury	Catawba College	Howard R. Omwake
Salisbury	Livingstone College	W. J. Trent
Wake Forest	Wake Forest College	Thurman D. Kitchin
Wilson	Atlantic Christian College	H. S. Hilley
Winston-Salem	Salem College	H. E. Rondthaler
Winston-Salem	Winston-Salem Teachers College	F. L. Atkins
North Dakota		
Dickinson	State Normal School	C. L. Kjerstad
Ellendale	State Normal & Industrial School	J. C. McMillan, Acting
Fargo	North Dakota Agricultural College	John H. Shepperd
Grand Forks	University of North Dakota	John C. West
Grand Forks	Wesley College	Charles L. Wallace
Jamestown	Jamestown College	B. H. Kroeze
Mayville	State Teachers College	Carl C. Swain
Minot	State Teachers College	G. A. McFarland
Valley City	State Teachers College	J. Frederick Weltzin
Ohio		
Ada	Ohio Northern University	Robert Williams
Akron	University of Akron	H. E. Simmons
Alliance	Mount Union College	Wm. H. McMaster
Ashland	Ashland College	Charles L. Anspach
Athens	Ohio University	Herman G. James
Berea	Baldwin-Wallace College	Louis Clinton Wright
Bluffton	Bluffton College	A. S. Rosenberger
Bowling Green	Bowling Green State University	H. B. Williams
Cedarville	Cedarville College	W. R. McChesney
Cincinnati	Teachers College, Athenaeum of Ohio	Carl J. Ryan, Dean
Cincinnati	University of Cincinnati	Raymond Walters
Cincinnati	Xavier University	Dennis F. Burns
Cleveland	John Carroll University	B. J. Rodman
Cleveland	Case School of Applied Science	Wm. E. Wickenden
Cleveland	Fenn College	C. V. Thomas
Cleveland	Ursuline College	Mother M. Veronica Nash
Cleveland	Western Reserve University	W. G. Leutner
Columbus	Capital University	Otto Mees
Columbus	Ohio State University	G. W. Rightmire
Dayton	University of Dayton	Walter C. Tredtin
Defiance	Defiance College	John W. Claxton
Delaware	Ohio Wesleyan University	Edmund D. Soper
East Columbus	St. Mary of the Springs College for Women	Sister M. Aloyse
Findlay	Findlay College	H. R. Dunathan
Gambier	Kenyon College	Wm. F. Peirce
Granville	Denison University	A. A. Shaw
Hiram	Hiram College	Kenneth I. Brown
Kent	Kent State University	J. O. Engleman
Marietta	Marietta College	D. T. Schoonover, Acting

City	Institution	President
Mount St. Joseph	College of Mount St. Joseph-on-the-Ohio	Mother Mary Regina
New Concord	Muskingum College	R. N. Montgomery
Oberlin	Oberlin College	Ernest H. Wilkins
Oxford	Miami University	
Oxford	Western College	Ralph K. Hickok
Painesville	Lake Erie College	Vivian B. Small
South Euclid	Notre Dame College	Mother Mary Evarista
Springfield	Wittenberg College	Rees Edgar Tulloss
Tiffin	Heidelberg College	Charles E. Miller
Toledo	Mary Manse College	Sister M. Catherine Raynor
Toledo	De Sales College	F. J. Macelwane
Toledo	University of the City of Toledo	Philip Curtis Nash
Westerville	Otterbein College	W. G. Clippinger
Wilberforce	Wilberforce University	D. O. Walker
Wilmington	Wilmington College	Walter L. Collins
Wooster	The College of Wooster	Charles F. Wishart
Yellow Springs	Antioch College	A. D. Henderson
Youngstown	Youngstown College	Howard W. Jones

Oklahoma

Ada	East Central State Teachers College	A. Linscheid
Alva	Northwestern State Teachers College	Ernest E. Brown
Bethany	Bethany-Peniel College	A. K. Bracken
Chickasha	Oklahoma College for Women	M. A. Nash
Durant	Southeastern State Teachers College	Kate G. Zaneis
Edmond	Central State Teachers College	John O. Moseley
Enid	Phillips University	I. N. McCash
Goodwell	Panhandle Agricultural & Mechanical College	Edward L. Morrison
Guthrie	Catholic College of Oklahoma for Young Women	Mother Mary Agnes Arvin
Langston	Colored Agricultural & Normal University	J. W. Sanford
Norman	University of Oklahoma	Wm. B. Bizzell
Oklahoma City	Oklahoma City University	A. G. Williamson
Shawnee	Oklahoma Baptist University	John W. Raley
Stillwater	Oklahoma Agricultural & Mechanical College	Henry G. Bennett
Tahlequah	Northeastern State Teachers College	John Vaughan
Tulsa	University of Tulsa	C. I. Pontius
Weatherford	Southwestern State Teachers College	W. W. Isle

Oregon

Albany	Albany College	Thomas W. Bibb
Ashland	Southern Oregon State Normal School	Walter Redford
Corvallis	Oregon State College	George W. Peavy
Eugene	University of Oregon	Clarence V. Boyer
Forest Grove	Pacific University	John F. Dobbs
La Grande	Eastern Oregon Normal School	H. E. Inlow
McMinnville	Linfield College	Elam J. Anderson
Monmouth	Oregon Normal School	J. A. Churchill
Newberg	Pacific College	Levi T. Pennington
Oswego	Marylhurst College	Sister M. Elizabeth Clare
Portland	North Pacific College	Herbert C. Miller
Portland	Reed College	Dexter M. Keezer
Portland	University of Portland	Michael J. Early
Salem	Willamette University	Bruce R. Baxter

Pennsylvania

Allentown	Cedar Crest College	Wm. F. Curtis
Allentown	Muhlenberg College	Robert C. Horn, Acting
Annville	Lebanon Valley College	Clyde A. Lynch
Beaver Falls	Geneva College	M. M. Pearce
Bethlehem	Lehigh University	Clement C. Williams
Bethlehem	Moravian College and Theological Seminary	Wm. N. Schwarze
Bethlehem	Moravian Seminary and College for Women	Edwin J. Heath
Bloomsburg	State Teachers College	Francis B. Haas
Bryn Athyn	Academy of the New Church	George De Charms
Bryn Mawr	Bryn Mawr College	Marion E. Park
California	State Teachers College	Robert M. Steele
Carlisle	Dickinson College	Fred P. Corson
Chambersburg	Wilson College	Paul S. Havens
Chester	Crozier Theological Seminary	James H. Franklin
Chester	Pennsylvania Military College	Frank K. Hyatt
Chestnut Hill	Mount St. Joseph College	Mother Mary James
Cheyney	Cheyney Training School for Teachers	L. P. Hill
Clarion	State Teachers College	G. C. L. Riemer
Collegeville	Ursinus College	N. E. McClure
Dallas	College Misericordia	Sister Mary Loretta
Easton	Lafayette College	Wm. Mather Lewis
East Stroudsburg	State Teachers College	T. T. Allen
Edinboro	State Teachers College	Carmon A. Ross
Elizabethtown	Elizabethtown College	Ralph W. Schlosser
Erie	Mercyhurst College	Sister M. Xavier O'Neil
Erie	Villa Maria College	Joseph J. Wehrle
Gettysburg	Gettysburg College	H. W. A. Hanson
Greensburg	Seton Hill College	J. A. W. Reeves
Greenville	Thiel College	Earl S. Rudisill
Grove City	Grove City College	Weir C. Ketler
Haverford	Haverford College	W. W. Comfort
Huntingdon	Juniata College	Charles C. Ellis
Immaculata	Immaculata College	Francis J. Furey
Indiana	State Teachers College	M. J. Walsh, Acting
Jenkintown	Beaver College	W. B. Greenway
Kutztown	State Teachers College	Quincy A. W. Rohrbach
Lancaster	Franklin & Marshall College	John A. Schaeffer
Latrobe	St. Vincent College	Alfred Koch
Lewisburg	Bucknell University	Arnaud C. Marts, Acting
Lincoln Univ	Lincoln University	Walter L. Wright
Lock Haven	State Teachers College	D. W. Armstrong
Loretto	St. Francis College	John P. J. Sullivan
Mansfield	State Teachers College	A. T. Belknap
Meadville	Allegheny College	Wm. P. Tolley
Millersville	State Teachers College	Landis Tanger
New Wilmington	Westminster College	Robert F. Galbreath
Philadelphia	Drexel Institute of Technology	Parke R. Kolbe
Philadelphia	Dropsie College	Cyrus Adler
Philadelphia	Hahnemann Medical College	W. A. Pearson
Philadelphia	Jefferson Medical College	Ross V. Patterson
Philadelphia	La Salle College	Brother E. Anselm
Philadelphia	Philadelphia College of Osteopathy	Edgar O. Holden
Philadelphia	Philadelphia College of Pharmacy & Science	Wilmer Krusen
Philadelphia	St. Joseph's College	Thomas J. Higgins
Philadelphia	Temple University	Charles E. Beury
Philadelphia	University of Pennsylvania	Thomas S. Gates
Philadelphia	Women's Medical College of Pennsylvania	Chevalier Jackson
Pittsburgh	Carnegie Institute of Technology	R. E. Doherty
Pittsburgh	Duquesne University	J. J. Callahan
Pittsburgh	H. C. Frick Training School for Teachers	Dana Z. Eckert*
Pittsburgh	Mount Mercy College	Mother M. Irenaeus
Pittsburgh	Pennsylvania College for Women	Herbert L. Spencer
Pittsburgh	University of Pittsburgh	John G. Bowman, Chancellor
Reading	Albright College	J. Warren Klein
Rosemont	Rosemont College	Mother Mary Ignatius
Scranton	Marywood College	Mother M. Josepha
Scranton	St. Thomas College	Brother D. Edward
Selinsgrove	Susquehanna University	G. Morris Smith
Shippensburg	State Teachers College	A. L. Rowland
Slippery Rock	State Teachers College	C. S. Miller
State College	Pennsylvania State College	Ralph D. Hetzel
Swarthmore	Swarthmore College	Frank Aydelotte
Villanova	Villanova College	E. V. Stanford
Washington	Washington & Jefferson College	Ralph Cooper Hutchison
Waynesburg	Waynesburg College	Paul R. Stewart
West Chester	State Teachers College	Charles S. Swope

Rhode Island

Kingston	Rhode Island State College	Raymond G. Bressler
Providence	Brown University	C. A. Barbour
Providence	Providence College	John J. Dillon
Providence	Rhode Island College of Education	John L. Alger
Providence	Rhode Island College of Pharmacy & Allied Sciences	M. H. Corrigan

South Carolina

Charleston	The Citadel—The Military College of South Carolina	Chas. P. Summerall
Charleston	College of Charleston	Harrison Randolph
Charleston	Medical College of the State of South Carolina	Robert Wilson
Clemson College	Clemson Agricultural College	Enoch W. Sikes
Clinton	Presbyterian College	William P. Jacobs
Columbia	Allen University	Abram L. Simpson
Columbia	Benedict College	J. J. Starks
Columbia	Columbia College	J. Caldwell Guilds
Columbia	University of South Carolina	J. R. McKissick

City	Institution	President
Due West	Erskine College	Robert C. Grier
Gaffney	Limestone College	R. C. Granberry
Greenville	Furman University	B. E. Geer
Greenville	Greenville Woman's College	B. E. Geer
Greenwood	Lander College	J. W. Speake
Hartsville	Coker College	Carlyle Campbell
Newberry	Newberry College	James C. Kinard
Orangeburg	Claflin College	J. B. Randolph
Orangeburg	State Agricultural and Mechanical College	M. F. Whittaker
Rock Hill	Winthrop College	Shelton Phelps
Spartanburg	Converse College	Edward M. Gwathmey
Spartanburg	Wofford College	Henry N. Snyder

South Dakota

Aberdeen	Northern State Teachers College	Carl G. Lawrence
Brookings	South Dakota State College of Agriculture & Mechanic Arts	C. W. Pugsley
Huron	Huron College	Frank L. Eversull
Madison	Eastern State Normal School	V. A. Lowry
Mitchell	Dakota Wesleyan University	Leon H. Sweetland
Rapid City	State School of Mines	Joseph P. Connolly
Sioux Falls	Augustana College	Clemens M. Granskou
Sioux Falls	Sioux Falls College	C. R. Sattgast
Spearfish	Spearfish Normal School	E. C. Woodburn
Springfield	Southern State Normal School	W. A. Thompson
Vermilion	University of South Dakota	I. D. Weeks
Yankton	Yankton College	G. W. Nash

Tennessee

Bristol	King College	Thomas P. Johnston
Chattanooga	University of Chattanooga	Alexander Guerry
Clarksville	Austin Peay Normal School	P. P. Claxton
Cleveland	Bob Jones College	Bob Jones, Sr.
Cookeville	Tennessee Polytechnic Institute	Q. M. Smith
Greenville	Tusculum College	C. A. Anderson
Harrogate	Lincoln Memorial University	S. W. McClelland
Jackson	Lambuth College	Richard E. Womack
Jackson	Lane College	J. F. Lane
Jackson	Union University	John J. Hurt
Jefferson City	Carson-Newman College	James T. Warren
Johnson City	State Teachers College	C. C. Sherrod
Knoxville	Knoxville College	S. M. Laing
Knoxville	The University of Tennessee	James D. Hoskins
Lebanon	Cumberland University	Ernest L. Stockton
McKenzie	Bethel College	L. L. Thomas
Madison College	Nashville Agricultural Normal Institute	E. A. Sutherland
Maryville	Maryville College	Ralph Waldo Lloyd
Memphis	Southwestern	Charles E. Diehl
Memphis	State Teachers College	J. W. Brister
Milligan College	Milligan College	H. J. Derthick
Murfreesboro	State Teachers College	P. A. Lyon
Murfreesboro	Tennessee College	J. A. Kirtley, Acting
Nashville	Fisk University	Thomas E. Jones
Nashville	George Peabody College for Teachers	Bruce R. Payne
Nashville	Scarritt College	Jesse Lee Cunninggim
Nashville	Tennessee Agricultural & Industrial State Teachers College	W. J. Hale
Nashville	Vanderbilt University	James H. Kirkland
Sewanee	University of the South	Benj. F. Finney

Texas

Abilene	Abilene Christian College	James F. Cox
Abilene	Hardin-Simmons University	J. D. Sandefer
Abilene	McMurry College	T. W. Brabham
Alpine	Sul Ross State Teachers College	H. W. Morelock
Austin	Samuel Huston College	Stanley E. Grannum
Austin	St. Edward's University	Joseph Maguire
Austin	Tillotson College	Mary E. Branch
Austin	The University of Texas	H. Y. Benedict
Belton	Mary Hardin-Baylor College	J. C. Hardy
Brownwood	Daniel Baker College	Robert Guy Davis
Brownwood	Howard Payne College	Thomas H. Taylor
Canyon	West Texas State Teachers College	J. A. Hill
College Station	Agricultural & Mechanical College of Texas	T. O. Walton
Commerce	East Texas State Teachers College	Sam H. Whitley
Dallas	Southern Methodist University	Chas. C. Selecman
Denton	North Texas State Teachers College	W. J. McConnell
Denton	College of Industrial Arts	Louis H. Hubbard
El Paso	College of Mines and Metallurgy	D. M. Wiggins
Fort Worth	Texas Christian University	Edward McS. Waits
Fort Worth	Texas Wesleyan College	Law Sone
Georgetown	Southwestern University	J. W. Bergin
Houston	The Rice Institute	Edgar Odell Lovett
Huntsville	Sam Houston State Teachers College	H. F. Estill
Kingsville	Texas College of Arts & Industries	J. O. Loftin
Lubbock	Texas Technological College	Bradford Knapp
Marshall	Bishop College	Joseph J. Rhoads
Marshall	Wiley College	M. W. Dogan
Nacogdoches	Stephen F. Austin State Teachers College	A. W. Birdwell
Prairie View	Prairie View State College	W. R. Banks*
San Antonio	Incarnate Word College	Sister M. Columkille
San Antonio	Our Lady of the Lake College	H. A. Constantineau
San Antonio	St. Mary's University	Alfred H. Rabe
San Antonio	Westmoorland College	Will W. Jackson
San Marcos	Southwest Texas State Teachers College	C. E. Evans
Seguin	Guadalupe College	J. R. Lockett
Sherman	Austin College	Everett B. Tucker
Tyler	Texas College	D. R. Glass
Waco	Baylor University	Pat M. Neff
Waxahachie	Trinity University	F. L. Wear

Utah

Logan	Utah State Agricultural College	Elmer G. Peterson
Provo	Brigham Young University	Franklin S. Harris
Salt Lake City	College of St. Mary-of-the-Wasatch	Sister Mary Veronique
Salt Lake City	University of Utah	George Thomas

Vermont

Bennington	Bennington College	Robert D. Leigh
Burlington	University of Vermont	Guy W. Bailey
Johnson	State Normal School	Donald W. McClelland
Middlebury	Middlebury College	Paul D. Moody
Northfield	Norwich University	Porter H. Adams
Winooski Park	St. Michael's College	L. E. Gosselin

Virginia

Alexandria	Protestant Episcopal Theological Seminary	W. E. Rollins
Ashland	Randolph-Macon College	Rob't E. Blackwell
Blacksburg	Virginia Polytechnic Institute	Julian A. Burruss
Bridgewater	Bridgewater College	Paul H. Bowman
Charlottesville	University of Virginia	John Lloyd Newcomb
Dayton	Shenandoah College & Conservatory of Music	Wade S. Miller
East Radford	State Teachers College	John P. McConnell
Emory	Emory & Henry College	J. N. Hillman
Ettrick	Virginia State College for Negroes	John M. Gandy
Farmville	State Teachers College	J. L. Jarman
Fredericksburg	State Teachers College	Morgan L. Combs
Hampden-Sydney	Hampden-Sydney College	J. D. Eggleston
Hampton	Hampton Institute	Arthur Howe
Harrisonburg	State Teachers College	S. P. Duke
Hollins College	Hollins College	Bessie C. Randolph
Lawrenceville	St. Paul Normal School	J. A. Russell
Lexington	Virginia Military Institute	J. A. Lejeune, Supt.
Lexington	Washington & Lee University	Francis P. Gaines
Lynchburg	Lynchburg College	R. B. Montgomery
Lynchburg	Randolph-Macon Woman's College	Theo. Henley Jack
Lynchburg	Virginia Theological Seminary and College	W. H. R. Powell
Richmond	Medical College of Virginia	William T. Sanger
Richmond	University of Richmond	F. W. Boatwright
Richmond	Virginia Union University	William J. Clark
Salem	Roanoke College	Chas. J. Smith
Staunton	Mary Baldwin College	L. Wilson Jarman
Sweet Briar	Sweet Briar College	Meta Glass
Williamsburg	College of William & Mary	John Stewart Bryan

Washington

Bellingham	College of Education	C. H. Fisher
Cheney	State Normal School	R. T. Hargreaves
College Place	Walla Walla College	Wm. M. Landeen
Ellensburg	Washington State Normal School	Rob't E. McConnell
Pullman	State College of Washington	Ernest O. Holland
Seattle	Seattle Pacific College	Charles H. Watson
Seattle	University of Washington	Lee Paul Sieg
Spokane	Gonzaga University	Leo J. Robinson
Spokane	Whitworth College	Ward W. Sullivan
Tacoma	College of Puget Sound	Edward H. Todd
Walla Walla	Whitman College	Walter A. Bratton, Acting

City	Institution	President
West Virginia		
Athens	Concord State Teachers College	J. Frank Marsh
Bethany	Bethany College	W. H. Cramblet
Bluefield	Bluefield State Teachers College	Henry Lake Dickason
Buckhannon	West Virginia Wesleyan College	Roy McCuskey
Charleston	Morris Harvey College	Leonard Riggleman
Elkins	Davis & Elkins College	Chas. E. Albert
Fairmont	Fairmont State Teachers College	Joseph Rosier
Glenville	Glenville State Teachers College	E. G. Rohrbough
Harpers Ferry	Storer College	H. T. McDonald
Huntington	Marshall College	James E. Allen
Institute	West Virginia State College	John W. Davis
Montgomery	New River State College	E. S. Maclin
Morgantown	West Virginia University	C. S. Boucher
Salem	Salem College	S. Orestes Bond
Shepherdstown	Shepherd State Teachers College	W. H. S. White
West Liberty	West Liberty State Teachers College	Paul N. Elbin
Wisconsin		
Appleton	Lawrence College	Henry M. Wriston
Ashland	Northland College	J. D. Brownell
Beloit	Beloit College	Irving Maurer
Eau Claire	State Teachers College	H. A. Schofield
La Crosse	State Teachers College	Geo. M. Snodgrass
Madison	University of Wisconsin	Glenn Frank
Menomonie	The Stout Institute	Burton E. Nelson
Milton	Milton College	Jay W. Crofoot
Milwaukee	Marquette University	William M. Magee
Milwaukee	Milwaukee-Downer College	Lucia R. Briggs
Milwaukee	Mount Mary College	Edw. A. Fitzpatrick
Milwaukee	State Teachers College	Frank E. Baker
Nashotah	Nashotah House	E. J. Nutter
Oshkosh	State Teachers College	Forrest R. Polk
Platteville	State Teachers College	Asa M. Royce
Plymouth	Mission House College	Paul Grosshuesch
Ripon	Ripon College	Silas Evans
River Falls	State Teachers College	J. H. Ames
Stevens Point	State Teachers College	Frank S. Hyer
Superior	State Teachers College	Jim Dan Hill
Watertown	Northwestern College	Erwin E. Kowalke
Waukesha	Carroll College	Wm. A. Ganfield
West De Pere	St. Norbert College	B. H. Pennings
Whitewater	State Teachers College	C. M. Yoder
Wyoming		
Laramie	University of Wyoming	Arthur G. Crane

City	Institution	President
Possessions		
College, Alaska	University of Alaska	Charles E. Bunnell
Honolulu, Hawaii	Teachers College, University of Hawaii	Benjamin O. Wist, Dean
Honolulu, Hawaii	University of Hawaii	David L. Crawford
Dumaguete, Philippine Islands	Silliman University	Roy H. Brown
Manila, Philippine Islands	Mapua Institute of Technology	Thomas Mapua
Manila, Philippine Islands	Philippine Normal School	R. K. Gilmore, Supt.
Manila, Philippine Islands	University of the Philippines	Jorge Bocobo
Rio Piedras, Porto Rico	University of Puerto Rico	Juan B. Soto
Canada		
Antigonish, N. S.	St. Francis Xavier University	D. J. Macdonald
Aurora, Ont.	St. Andrew's College	Kenneth G. B. Ketchum
Belleville, Ont.	Albert College	Bert Howard
Charlottetown, P. E. I.	St. Dunstan's College	J. A. Murphy
Edmonton, Alta.	University of Alberta	W. A. R. Kerr, Acting
Fredericton, N. B.	University of New Brunswick	C. C. Jones
Halifax, N. S.	Dalhousie University	Carleton Stanley
Halifax, N. S.	Halifax Ladies College	E. Florence Blackwood
Halifax, N. S.	University of King's College	A. H. Moore
Hamilton, Ont.	McMaster University	H. P. Whidden, Chancellor
Kingston, Ont.	Queen's University	R. C. Wallace*
Kitchener, Ont.	St. Jerome's College	Wm. G. Borks
Lennoxville, Que.	Bishop's University	A. H. McGreer*
London, Ont.	University of Western Ontario	Wm. Sherwood Fox
Montreal, Que.	Loyola College	H. C. McCarthy
Montreal, Que.	Montreal University	Raoul Dandurand
Ottawa, Ont.	Ottawa University Normal School	Rene Lamoureux*
Quebec, Que.	Laval University	Camille Roy
Regina, Sask.	Regina College	E. W. Stapleford
St. Joseph, N. B.	St. Joseph's University	L. LaPalme
St. Thomas, Ont.	Alma College	P. S. Dobson*
Saskatoon, Sask.	University of Saskatchewan	W. C. Murray
Stanstead, Que.	Stanstead Wesleyan College	E. C. Amaron*
Toronto, Ont.	University of Toronto	H. J. Cody
Toronto, Ont.	Upper Canada College	T. W. L. MacDermot
Toronto, Ont.	Victoria University	E. W. Wallace
Truro, N. S.	Nova Scotia Agricultural College	Lyman T. Chapman
Vancouver, B. C.	University of British Columbia	Leonard S. Klinck
Winnipeg, Man.	University of Manitoba	Sidney E. Smith
Winnipeg, Man.	Wesley College	John H. Riddell
Wolfville, N. S.	Acadia University	F. W. Patterson

SECTION XII

PRESIDENTS OF JUNIOR COLLEGES

City	Institution	President
Alabama		
Marion	Marion Institute	Walter I. Murfee
St. Bernard	St. Bernard Junior College	Ambrose Reger
Arizona		
Phoenix	Phoenix Junior College	E. W. Montgomery
Thatcher	Gila Junior College	E. Edgar Fuller
Arkansas		
Conway	Central College	J. S. Rogers
Fort Smith	Fort Smith Junior College	J. W. Ramsey
Jonesboro	Jonesboro Baptist College	H. E. Walters
Little Rock	Little Rock Junior College	J. A. Larson
Magnolia	State Agricultural & Mechanical College	C. A. Overstreet
Monticello	Arkansas Agricultural & Mechanical College	Marvin Bankston
Russellville	Arkansas Polytechnic College	J. W. Hull
Sheridan	Missionary Baptist College	J. W. Overall
California		
Arlington	Southern California Junior College	E. E. Cossentine
Azusa	Citrus Junior College	F. S. Hayden
Bakersfield	Bakersfield Junior College	Grace V. Bird, Dean
Berkeley	Armstrong College	J. Evan Armstrong
Berkeley	Williams Institute	Cora L. Williams
Brawley	Brawley Junior College	Percy E. Palmer
Coalinga	Coalinga Extension Center	T. A. Ellestad, Dean
Compton	Compton Junior College	O. Scott Thompson
El Centro	Central Junior College	Guy A. Weakley
Fresno	Fresno Technical Junior College	R. F. Aspinall
Fullerton	Fullerton Junior College	Louis E. Plummer
Glendale	Glendale Junior College	Charles A. Nelson
Hollister	San Benito County Junior College	James P. Davis
Kentfield	Marin Junior College	A. C. Olney
Lancaster	Antelope Valley Junior College	Roy A. Knapp
Long Beach	Long Beach Junior College	John L. Lounsbury
Los Angeles	Los Angeles Junior College	Rosco C. Ingalls
Los Angeles	Los Angeles Pacific College	Byron S. Lamson
Marysville	Yuba County Junior College	Pedro Osuna
Modesto	Modesto Junior College	D. C. Baker
Oceanside	Oceanside Junior College	G. R. McIntire
Ontario	Chaffey Junior College	Gardiner W. Spring
Pasadena	Pasadena Junior College	John W. Harbeson
Pomona	Pomona Junior College	J. E. Walker
Porterville	Porterville Junior College	B. H. Grisemer
Reedley	Reedley Junior College	J. O. McLaughlin
Riverside	Riverside Junior College	A. G. Paul
Sacramento	Sacramento Junior College	J. B. Lillard
Salinas	Salinas Junior College	J. B. Lemos
San Bernardino	San Bernardino Valley Union Junior College	Nicholas Ricciardi
San Francisco	Cogswell Polytechnical College	George B. Miller
San Francisco	Golden Gate College	Nagel T. Miner
San Luis Obispo	California State Polytechnic	Julian A. McPhee
San Mateo	San Mateo Junior College	Charles S. Morris
Santa Ana	Santa Ana Junior College	D. K. Hammond
Santa Maria	Santa Maria Junior College	A. P. Hill, Jr.
Santa Monica	Santa Monica Junior College	Ralph H. Bush
Santa Rosa	Santa Rosa Junior College	Floyd P. Bailey
Susanville	Lassen Junior College	I. V. Funderburgh
Taft	Taft Junior College	Frank A. Bauman
Ventura	Ventura Junior College	D. R. Henry
Visalia	Visalia Junior College	I. D. Steele
Colorado		
Denver	Colorado Vocational College	Rolland M. Shreves
Denver	Colorado Woman's College	J. E. Hutchingson
Grand Junction	Grand Junction State Junior College	Clifford G. Houston
Pueblo	Southern Colorado Junior College	E. T. Kelly
Trinidad	Trinidad State Junior College	William R. Ross
Connecticut		
Bridgeport	Junior College of Connecticut	E. Everett Cortright
Greenwich	Edgewood Park Junior College	M. H. Reaser
New Haven	Larson Junior College	George V. Larson
Thompson	Marot Junior College	Mary L. Marot
District of Columbia		
Washington	Marjorie Webster Schools, Inc.	Marjorie Webster
Florida		
De Funiak Springs	Palmer College and Academy	Pierre W. Du Bose
St. Petersburg	St. Petersburg Junior College	Robert B. Reed
Sarasota	Ringling School of Art	Verman Kimbrough
Georgia		
Augusta	Junior College of Augusta	J. L. Skinner
Barnesville	Gordon Military College	J. E. Guillebeau
Bowdon	Bowdon College	Eldon Dittemore
Carrollton	West Georgia College	I. S. Ingram
Cochran	Middle Georgia College	L. H. Browning
College Park	Cox College	W. C. Carlton
Cuthbert	Andrew College	S. C. Olliff
Dahlonega	North Georgia College	Jonathan C. Rogers
Douglas	South Georgia College	J. M. Thrash
Milledgeville	Georgia Military College	
Mount Vernon	Brewton-Parker Junior College	A. M. Gates
Norman Park	Norman Junior College	Paul Carroll
Tifton	Abraham Baldwin Agricultural College	G. W. King
Young Harris	Young L. G. Harris College	T. Jack Lance
Waleska	Reinhardt College	W. M. Bratton
Idaho		
Boise	Boise Junior College	Dorothy Atkinson
Coeur d'Alene	Coeur d'Alene Junior College	Orrin E. Lee
Pocatello	University of Idaho, Southern Branch	J. R. Nichols, Exec. Dean
Rexburg	Ricks College	Hyrum Manwaring
Illinois		
Carlinville	Blackburn College	William M. Hudson
Chicago	Chicago Christian College	Frederick H. Wezeman
Chicago	Emerson Junior College	George F. Mott
Chicago	Herzl City Junior College	Dorph Brown, Dean
Chicago	North Park College	Algoth Ohlson
Chicago	Peoples Junior College	Philip L. Seman
Chicago	South Side City Junior College	Butler Laughlin
Chicago	George Williams College	Harold Coe Coffman
Chicago	Wright City Junior College	W. H. Conley, Dean
Cicero	Morton Junior College	L. R. Hrudka
Danville	Danville Junior College	Hersel W. Hudson
Godfrey	Monticello College	George I. Rohrbough
Harvey	Thornton Junior College	William E. McVey
Joliet	Joliet Junior College	W. W. Haggard
La Grange	Lyons Township Junior College	Ross Holt, Acting Dean
La Salle	La Salle-Peru-Oglesby Junior College	F. A. Jensen
Lincoln	Lincoln College	Wm. D. Copeland
Mt. Carroll	Frances Shimer Junior College	Raymond B. Culver
Oak Park	Oak Park Junior College	T. P. Carpenter

City	Institution	President
Quincy	Quincy College	John Koebele
Springfield	Springfield Junior College	Augustine Confrey
Wilmette	Mallinkrodt College	Mother Sebastian

Indiana

Collegeville	St. Joseph's College	Joseph B. Kenkel
Fort Wayne	Concordia College	William C. Burhop
Gary	Gary College	Albert Ritsch
Kokomo	Kokomo Junior College	H. A. Urake
Vincennes	Vincennes University	Walter A. Davis

Iowa

Albia	Albia Junior College	John S. Chambers, Dean
Bloomfield	Bloomfield Junior College	H. Ostergaard
Boone	Boone Junior College	J. R. Thorngren
Britt	Britt Junior College	L. J. Thies
Burlington	Burlington Junior College	Ray H. Bracewell
Cedar Rapids	Mount Mercy Junior College	Sister Mary Xavier
Centerville	Centerville Junior College	E. Wayne Hilmer
Chariton	Chariton Junior College	F. A. Lunan, Dean
Clarinda	Clarinda Junior College	Herbert L. Glynn, Dean
Clinton	Mount St. Clare Junior College	Mother M. Paul Carrico
Creston	Creston Junior College	V. L. Sanders
Des Moines	Des Moines Catholic College	
Des Moines	Grand View College	C. Arild Olsen
Eagle Grove	Eagle Grove Junior College	C. L. McDowell
Elkader	Elkader Junior College	J. Dale Welsch
Emmettsburg	Emmettsburg Junior College	R. W. Newell
Estherville	Estherville Junior College	N. E. Demoney, Dean
Forest City	Waldorf College	J. L. Rendahl
Fort Dodge	Fort Dodge Junior College	Harris Dickey, Dean
Hopkinton	Lenox College	E. V. Laughlin, Dean
Independence	Independence Junior College	Q. A. Wemple, Dean
Iowa Falls	Ellsworth Junior College	Sheridan R. Jones
Lamoni	Graceland College	G. N. Briggs
Maquoketa	Maquoketa Junior College	B. S. Moyle
Marshalltown	Marshalltown Junior College	B. R. Miller
Mason City	Mason City Junior College	Sigvart L. Rugland, Dean
Muscatine	Muscatine Junior College	Willetta Strahan, Dean
Orange City	Northwestern Junior College	Jacob Heemstra
Osceola	Osceola Junior College	Lillian V. Hjort, Dean
Ottumwa	Ottumwa Heights College	Mother M. Geraldine
Red Oak	Red Oak Public Junior College	J. R. Inman
Sheldon	Sheldon Junior College	W. C. Jackman
Sioux City	Briar Cliff Junior College	Sister Mary Servatius
Tipton	Tipton Junior College	C. W. Cowan
Washington	Washington Junior College	Harland W. Mead
Waukon	Waukon Junior College	B. K. Orr
Webster City	Webster City Junior College	Harry L. Rice, Dean

Kansas

Arkansas City	Arkansas City Junior College	E. A. Funk
Coffeyville	Coffeyville Junior College	E. C. McReynolds, Dean
El Dorado	El Dorado Junior College	Earl Walker, Dean
Fort Scott	Fort Scott Junior College	W. S. Davison, Dean
Garden City	Garden City Junior College	Ira O. Scott
Haviland	Friends Bible College	Bernard E. Mott
Hesston	Hesston College & Bible School	Milo Kauffman
Highland	Highland College	C. M. Rankin
Hutchinson	Hutchinson Junior College	C. M. Lockman, Dean
Independence	Independence Junior College	E. R. Stevens
Iola	Iola Junior College	R. H. Carpenter
Kansas City	Kansas City, Kansas Junior College	J. F. Wellemeyer
McPherson	Central Academy & College	Charles A. Stoll
Paola	College of Paola	Mother Jerome Schaub
Parsons	Parsons Junior College	E. F. Farner, Dean
Winfield	St. John's College	Carl S. Mundinger

Kentucky

Campbellsville	Campbellsville College	D. J. Wright
Columbia	Lindsey-Wilson Junior College	A. P. White
Covington	Villa Madonna College	M. Leick
Hopkinsville	Bethel Woman's College	J. W. Gaines
Jackson	Lee Junior College	J. O. Van Meter
London	Sue Bennett College	K. C. East
Louisville	Sacred Heart College	Sister M. Dominica, Dean
Maple Mount	Mount St. Joseph Junior College	Sister M. C. Eckmans, Dean
Nazareth	Nazareth Junior College	Sister M. Ignatius
Paducah	Paducah Junior College	R. G. Matheson, Jr., Dean
Pikeville	Pikeville Junior College	Frank D. McClelland
Pippapass	Caney Junior College	Charles Houghton
St. Catherine	St. Catherine Junior College	Mother Mary Louis
St. Mary	St. Mary's College	Francis J. Jaglowicz
Williamsburg	Cumberland College	James L. Creech

Louisiana

Grand Coteau	Normal College & Academy of Sacred Heart	Mother Sullivan
Hammond	Southeastern Louisiana College	Y. L. Fontenot
Lafayette	De La Salle Normal School	Brother A. Arsenius
Monroe	Northeast Center, L. S. U.	C. C. Colvert, Dean
Shreveport	Dodd College	E. C. Solomon
Shreveport	St. Vincent's College	Mother Eugenia

Maine

Portland	Westbrook Junior College	Milton D. Proctor
Springvale	Nasson College	Dawn N. Wallace

Maryland

Catonsville	St. Charles College	George A. Gleason
New Windsor	Blue Ridge College	Edward C. Bixler
St. Mary's City	St. Mary's Female Seminary	M. Adele France

Massachusetts

Auburndale	Lasell Junior College	Guy M. Winslow
Bradford	Bradford Junior College	Katharine M. Denworth
Dudley	Nichols Junior College	James L. Conrad
Waltham	University of Massachusetts	Frank L. Whipple
Wellesley	Pine Manor Junior College	Marie W. Potter

Michigan

Adrian	St. Joseph's College & Academy	Mother M. Gerald
Bay City	Bay City Junior College	George E. Butterfield
Flint	Flint Junior College	W. S. Shattuck, Dean
Grand Rapids	Catholic Junior College	A. F. Bukowski
Grand Rapids	Grand Rapids Junior College	Arthur Andrews
Highland Park	Highland Park Junior College	George I. Altenburg, Dean
Ironwood	Ironwood Junior College	R. Ernest Dear, Dean
Jackson	Jackson Junior College	H. A. Steele
Muskegon	Muskegon Junior College	A. G. Umbreit
Pontiac	Pontiac Junior College	John Thors, Jr.
Port Huron	Port Huron Junior College	John H. McKenzie
Spring Arbor	Spring Arbor Seminary & Junior College	LeRoy M. Lowell

Minnesota

Coleraine	Itasca Junior College	Carl C. Guise
Duluth	Duluth Junior College	R. D. Chadwick, Dean
Ely	Ely Junior College	S. F. Olson, Dean
Eveleth	Eveleth Junior College	O. H. Gibson
Hibbing	Hibbing Junior College	H. A. Drescher
Rochester	Rochester Junior College	R. W. Goddard
St. Paul	Concordia College	Martin Graebner
Virginia	Virginia Junior College	Floyd B. Moe, Dean

Mississippi

Brookhaven	Whitworth College	G. F. Winfield
Clinton	Hillman College	M. P. L. Berry
Decatur	East Central Junior College	L. O. Todd
Ellisville	Jones County Junior College	M. P. Bush
Goodman	Holmes Junior College	M. McDaniel
Grenada	Grenada College	W. C. Newman
Gulfport	Gulf Park College	Richard G. Cox
Holly Springs	Mississippi Synodical College	R. F. Cooper
Mathiston	Wood Junior College	Jasper Weber
Moorhead	Sunflower Junior College	Paul M. West
Newton	Clarke Memorial College	C. Z. Holland
Perkinston	Harrison-Stone-Jackson Junior College	C. J. Derby
Poplarville	Pearl River Junior College	J. F. Stuart
Raymond	Hinds Junior College	G. J. Cain
Scooba	East Mississippi Junior College	J. D. Wallace

City	Institution	President
Senatobia	Northwest Mississippi Junior College	R. C. Pugh
Summit	Southwest Mississippi Junior College	J. M. Kenna
Vicksburg	All Saints Episcopal College	Mary L. Newton, Dean
Wesson	Copiah-Lincoln Junior College	James M. Ewing

Missouri

Bolivar	Southwest Baptist College	Courts Redford
Cameron	Inter-County Junior College	A. L. Jones
Columbia	Christian College	Eugene S. Briggs
Columbia	Stephens College	James M. Wood
Conception	Conception Junior College	Thomas Allen, Dean
Concordia	St. Paul's College	Ottomar Krueger
Flat River	Flat River Junior College	Irvin F. Coyle, Dean
Fulton	William Woods College	H. G. Harmon
Hannibal	Hannibal-La Grange College	Andrew F. Morris
Iberia	Iberia Junior College	G. Byron Smith
Jefferson City	Jefferson City Junior College	William F. Knox
Kansas City	Junior College of Kansas City	Edward M. Bainter
Kansas City	St. Teresa's Junior College	Mother Marcella
Kansas City	University of Kansas City	I. D. Spaeth
Kansas City	Western College	R. T. Frye
Moberly	Moberly Junior College	M. A. Spohrer, Dean
Monett	Monett Junior College	M. L. Coleman
Nevada	Cottey College	Florence E. Boehmer
St. Joseph	St. Joseph Junior College	Nelle Blum, Dean
St. Louis	Notre Dame Junior College	Sister Mary Chrysologa
Trenton	Trenton Junior College	W. H. McDonald, Supt.
Warrenton	Central Wesleyan College	Franklin F. Lewis

Montana

Great Falls	Great Falls Junior College	J. A. Rooney
Havre	Northern Montana College	G. H. Vande Bogart

Nebraska

Hebron	Hebron College and Academy	Walter H. Hellman
McCook	McCook Junior College	J. E. Shedd
Scottsbluff	Scottsbluff Junior College	Archer L. Burnham
Wahoo	Luther College	Paul M. Lindberg

New Hampshire

New London	Colby Junior College	H. Leslie Sawyer

New Jersey

Long Branch	Monmouth Junior College	Edward G. Schlaefer, Dean
Morristown	Morris County Junior College	Arthur S. Platt
Newark	Essex County Junior College	Byron W. Hartley
Paterson	College of Paterson	Herbert S. Robinson
Perth Amboy	Middlesex Junior College	Ladd Lukats, Dean
Roselle	Union County Junior College	Charles G. Cole, Dean
Teaneck	Junior College of Bergen County	C. L. Littel
Zarephath	Alma White College	Arthur K. Uhite

New Mexico

Portales	Eastern New Mexico Junior College	Donald W. Mackay

New York

Briarcliff Manor	Briarcliff Junior College	Doris L. Flick
Bronxville	Concordia Collegiate Institute	H. J. Rippe, Acting
North Chili	A. M. Chesbrough Seminary	Merlin G. Smith

North Carolina

Asheville	Biltmore Junior College	W. H. Jones
Banner Elk	Lees-McRae Junior College	Edgar H. Tufts
Belmont	Belmont Abbey Junior College	Cuthbert Allen, Rector
Boiling Springs	Boiling Springs Junior College	J. C. Burnett
Brevard	Brevard College	Eugene J. Coltrane
Buies Creek	Campbell College	L. H. Campbell
Louisburg	Louisburg College	Armour D. Wilcox
Mars Hill	Mars Hill College	Robert Lee Moore
Maxton	Presbyterian Junior College for Men	P. Cary Adams
Misenheimer	Pfeiffer Junior College	W. S. Sharp
Montreat	Montreat College	R. C. Anderson
Raleigh	Peace Junior College	William C. Pressly
Raleigh	St. Mary's School & Junior College	Mrs. Ernest Cruikshank
Rutherford College	Rutherford College	W. E. Wilson, Dean
Salemburg	Pineland Junior College	W. J. Jones
Statesville	Mitchell College	Mrs. W. B. Ramsay
Wingate	Wingate Junior College	Coy Muckle

North Dakota

Bottineau	North Dakota School of Forestry	Raymond W. McLees
Wahpeton	North Dakota State School of Science	E. F. Riley

Ohio

Rio Grande	Rio Grande College	William A. Lewis
Urbana	Urbana University	Russell Eaton

Oklahoma

Altus	Altus Municipal Junior College	A. G. Steele
Bacone	Bacone College	B. D. Weeks
Bartlesville	Bartlesville Junior College	Paul C. Norvell
Bristow	Bristow Junior College	E. H. Black
Claremore	Oklahoma Military Academy	Walter E. Downs
Durant	Oklahoma Presbyterian College	Andrew Bramlett
Lawton	Cameron State Agricultural College	Charles M. Conwill
Miami	Northeastern Oklahoma Junior College	John E. Holcomb
Muskogee	Muskogee Junior College	Bessie M. Huff
Okmulgee	Okmulgee Municipal Junior College	W. Max Chambers
Sapulpa	Sapulpa Junior College	E. H. McCune
Seminole	Seminole Junior College	John G. Mitchell
Tishomingo	Murray State School of Agriculture	Clive E. Murray
Tonkawa	University Preparatory School & Junior College	R. R. Robinson
Tulsa	Monte Cassino Junior College	Sister M. Hildegarde
Warner	Connors State Agricultural College	Jacob Johnson
Wetumka	Wetumka Junior College	G. S. Sanders
Wilburton	Eastern Oklahoma College	Ohland Morton
Woodward	Woodward Junior College	Wm. J. Mellor

Pennsylvania

Bryn Mawr	Harcum Junior College	Edith L. Harcum
Cambridge Springs	Alliance College	Edward N. Kuberski, Acting
Chambersburg	Penn Hall Junior College & Preparatory School	Frank S. Magill
La Plume	Scranton-Keystone Junior College	Byron S. Hollinshead
Lititz	Linden Hall Junior College	F. W. Stengel
Swarthmore	Wildcliff Junior College	H. M. Crist

South Carolina

Anderson	Anderson College	Annie D. Denmark
Central	Wesleyan Methodist College	John F. Childs
Spartanburg	Textile Industrial Institute	R. B. Burgess
Seneca	Seneca Junior College	J. D. Bryan

South Dakota

Freeman	Freeman Junior College	John D. Unruh
Mitchell	Notre Dame Junior College	J. M. Brady
Wessington Springs	Wessington Springs Junior College	W. A. Harden

Tennessee

Athens	Tennessee Wesleyan College	James L. Robb
Henderson	Freed-Hardeman College	N. B. Hardeman
Madisonville	Hiwassee College	J. M. Colston
Nashville	David Lipscomb College	E. H. Ijams
Nashville	Trevecca Nazarene College	A. B. Mackey, Acting

City	Institution	President
Nashville	Ward Belmont	John W. Barton
Pulaski	Martin College	Sinclair Daniel
Rogersville	Swift Memorial Junior College	W. C. Hargrave

Texas

Amarillo	Amarillo College	J. F. Mead
Arlington	North Texas Agricultural College	E. E. Davis, Dean
Beaumont	Lamar College	C. W. Bingman
Brownsville	Brownsville Junior College	E. C. Dodd
Clarendon	Clarendon Junior College	H. T. Burton
Clifton	Clifton College	C. Tyssen
Decatur	Decatur Baptist College	J. L. Ward
Edinburg	Edinburg Junior College	R. P. Ward
Fort Worth	Our Lady of Victory College	Sister Frances Regis
Gainesville	Gainesville Junior College	H. O. McCain
Greenville	Wesley College	J. E. Blackburn
Hillsboro	Hillsboro Junior College	L. W. Hartsfield
Houston	University of Houston	N. K. Dupre, Dean
Jacksonville	Jacksonville College	B. J. Albritton
Jacksonville	Lon Morris College	C. E. Peeples
Keene	Southwestern Junior College	H. H. Hamilton
Kerrville	Schreiner Institute	J. J. Delaney
Marshall	College of Marshall	F. S. Groner
Paris	Paris Junior College	J. R. McLemore
Plainview	Wayland College	G. W. McDonald
Ranger	Ranger Junior College	William T. Walton
San Angelo	San Angelo College	Felix E. Smith
San Antonio	San Antonio Junior College	J. E. Nelson
Seguin	Texas Lutheran College	Wm. F. Kraushaar
Sherman	Kidd-Key College & Conservatory	Edwin Kidd
Stephenville	John Tarleton Agricultural College	J. Thomas Davis, Dean
Tehuacana	Westminster College	Clarence A. Sutton
Temple	Temple Junior College	L. C. Procter
Terrell	Texas Military College	C. Williamson, Bus. Mgr.
Texarkana	Texarkana College	H. W. Stilwell
Tyler	Tyler Junior College	J. M. Hodges
Victoria	Victoria Junior College	P. S. Garner
Weatherford	Weatherford College	G. C. Boswell
Wichita Falls	Hardin Junior College	H. D. Fillers

Utah

Ephraim	Snow College	I. Owen Horsfall
Ogden	Weber College	L. H. Greer
Salt Lake City	Westminster College	H. W. Reherd

Vermont

Poultney	Green Mountain Junior College	Jesse P. Bogue

Virginia

Blackstone	Blackstone College for Girls	J. Paul Glick
Bluefield	Bluefield College	Edwin C. Wade
Bristol	Sullins College	W. E. Martin
Bristol	Virginia Intermont College	H. G. Noffsinger
Buena Vista	Southern Seminary & Junior College	Robert Lee Durham
Danville	Averett College	Curtis Bishop
Danville	Stratford College	John C. Simpson
Dayton	Shenandoah College & Conservatory of Music	Wade S. Miller
Harrisonburg	Eastern Mennonite School	John L. Stauffer, Acting
Marion	Marion College	E. H. Copenhaver
Petersburg	Southern College	Arthur K. Davis

Washington

Aberdeen	Grays Harbor Junior College	Lewis Tidball
Centralia	Centralia Junior College	Margaret Corbet
Lacey	St. Martin's College	Lambert Burton
Mount Vernon	Mount Vernon Junior College	Charles H. Lewis
Parkland	Pacific Lutheran College	O. A. Tingelstad
Seattle	Seattle College	John J. Balfe
Spokane	Spokane Junior College	G. H. Schlauch
Yakima	Yakima Valley Junior College	Elizabeth A. Prior

West Virginia

Beckley	Beckley College	J. L. Blumgardner
Bluefield	Bluefield College	Edwin C. Wade
Charleston	Kanawha College	L. S. McDaniel
Keyser	Potomac State School	J. W. Stayman
Lewisburg	Greenbrier College	F. W. Thompson
Philippi	Alderson-Broaddus Junior College	H. D. Pickett, Acting

Wisconsin

Madison	Edgewood Junior College	Sister Marie Aileen
Milwaukee	Concordia College	L. C. Rincker
Mt. Calvary	St. Lawrence College	Alexis Gore
St. Nazianz	Salvatorian Seminary	Edwin Buers

SECTION XIII

HEADS OF PRIVATE SCHOOLS

City	Institution	Head
Alabama		
Anniston	Alabama Military Institute	E. B. Fishburne
Birmingham	The Simpson School	J. M. Malone
Fairhope	School of Organic Education	Marietta Johnson
Mobile	University Military School	William S. Pape
Thorsby	Thorsby Institute	Helen C. Jenkins
California		
Berkeley	Anna Head School	Mary S. Wilson
Beverly Hills	Berkeley Hall School	Lelia L. Cooper
Claremont	Webb School of California	Thompson Webb
Culver City	Pacific Military Academy	Harry H. Culver
La Jolla	The Bishop's School	Caroline S. Cummins
Los Angeles	Cumnock School	Raymond C. Brooks
Los Angeles	Harvard School	Robert B. Gooden
Los Angeles	Marlborough School	Ada S. Blake
Los Angeles	Urban School	P. G. McDonnell
Los Angeles	Westlake School for Girls	Frederica de Laguna
Los Gatos	Montezuma Mountain Ranch School	E. A. Rogers
Menlo Park	Menlo School and Junior College	Lowry S. Howard
Pacific Beach	San Diego Army & Navy Academy	Robert E. Davis
Palo Alto	Castilleja School	Mary I. Lockey
Palo Alto	Miss Harker's School	Catherine Harker
Pasadena	Westridge School for Girls	Mary L. Ranney
San Francisco	Miss Burke's School	Barbara Burke
San Francisco	Drew School	John S. Drew
San Francisco	Sarah Dix Hamlin School	Mrs. E. B. Stanwood
Santa Barbara	Santa Barbara Girls School	E. Gertrude Gogin
Colorado		
Colorado Springs	Fountain Valley School	Francis Mitchell Froelicher
Denver	Kent School for Girls	Mary L. Rathvon
Connecticut		
Avon	Avon Old Farms	Percy G. Kammerer
Cheshire	Roxbury School	Arthur N. Sheriff
Clinton	Morgan School	George L. Scott
Farmington	Miss Porter's School	Robert Porter Keep
Greenwich	Brunswick School	Thomas C. Burton
Greenwich	The Edgewood School	Euphrosyne Langley
Greenwich	Greenwich Academy	Ruth West Campbell
Greenwich	Rosemary Hall	C. Ruutz-Rees
Hartford	Kingswood School	George R. H. Nicholson
Hartford	Oxford School	Ruth E. Guernsey
Kent	Kent School	Frederick H. Sill
Lakeville	Hotchkiss School	George Van Santvoord
Middlebury	Westover	Louise B. Dillingham
Milford	The Milford School	Paul D. Shafer
New Haven	Collegiate School	Arthur Pite
New Haven	Mrs. Day's School	Mrs. Clive Day
New Haven	Hamden Hall Country Day School	E. Stanley Taylor
New Haven	Hopkins Grammar School	George B. Lovell
New London	Bulkeley School	Homer K. Underwood
New London	Williams Memorial Institute	Colin S. Buell
New Milford	Canterbury School	Nelson Hume
Norwalk	Hillside Country School	Margaret R. Brendlinger
Norwich	Norwich Free Academy	Henry A. Terrell
Pomfret	Pomfret School	Halleck Lefferts
Rowayton	The Thomas School	Mabel Thomas
Simsbury	Ethel Walker School	Ethel Walker Smith
Simsbury	Westminster School	
South Kent	South Kent School	Samuel S. Bartlett
Stamford	The King School	V. A. Dwelle
Stamford	Low-Heywood School	Mary R. Roper
Suffield	Suffield School	Brownell Gage
Wallingford	The Choate School	George C. St. John
Washington	The Gunnery School	Hamilton Gibson
Washington	Wykeham Rise	Fanny E. Davies
Waterbury	St. Margaret's School	Alberta C. Edell
Watertown	The Taft School	Paul F. Cruikshank
West Hartford	Kingswood School	G. R. H. Nicholson
Windsor	The Loomis School	N. H. Batchelder
Winsted	The Gilbert School	Walter D. Hood
Delaware		
Middletown	St. Andrew's School	Walden Pell 2nd
Wilmington	Friends School	Wilmot R. Jones
Wilmington	Tower Hill School	Burton P. Fowler
District of Columbia		
Washington	Academy of the Holy Cross	Sister M. Rose Elizabeth
Washington	Arlington Hall	Carrie Sutherlin
Washington	Chevy Chase School	Mrs. Frederic E. Farrington, Regent
Washington	Devitt School	J. F. Byerly
Washington	Dunbarton College & Holy Cross Academy	Sister M. Rose Elizabeth
Washington	Emerson Institute	Winslow H. Randolph
Washington	Fairmont School	Maud van Woy
Washington	Georgetown Visitation Convent	Sister M. Sheesin
Washington	Gunston Hall	Mary L. Gildersleeve
Washington	Holton-Arms School, Inc.	Jessie M. Holton
Washington	Immaculata Seminary	Sister Frances Helen
Washington	Mt. Vernon Seminary and Junior College	Jean Dean Cole
Washington	National Cathedral School	Mabel B. Turner
Washington	St. Albans	Albert H. Lucas
Washington	Sidwell Friends School	Albert E. Rogers
Florida		
Jacksonville	The Bolles School	Roger M. Painter
Miami	The Cate School	W. B. Cate
Miami	Miss Harris, Florida School	Julia F. Harris
Miami Beach	Coburn Country Day School	Nelson Coburn
Orlando	Cathedral School	Mrs. Fred Lewter
Palm Beach	Palm Beach Private School	Karl B. Dearborn
St. Leo	St. Leo College Prep School	Francis Sadlier
St. Petersburg	Aikin Open Air School	Mrs. Maude Aikin
St. Petersburg	Florida Military Academy	W. B. Mendels
Georgia		
Atlanta	North Avenue Presbyterian School	Thyrza S. Askew
Atlanta	University School for Boys	W. E. Dendy
Atlanta	Washington Seminary	Llewellyn D. Scott
College Park	Georgia Military Academy	J. C. Woodward
Gainesville	Riverside Military Academy	Sandy Beaver
Mt. Zion	Mount Zion Seminary	Estella Searles Howard
Oxford	Emory at Oxford	George S. Roach
Rome	Darlington School	C. R. Wilcox
Savannah	Pape School	Nina A. Pape
Illinois		
Aledo	Roosevelt Military Academy	K. J. Stouffer
Alton	Western Military Academy	R. L. Jackson
Chicago	Chicago Latin School	James O. Wood
Chicago	Faulkner School for Girls	Elizabeth Faulkner
Chicago	The Girls Latin School of Chicago	Elizabeth Singleton
Chicago	Harvard School for Boys	Charles E. Pence
Chicago	Loring School	Cecilia Russell
Chicago	Luther Institute	John C. Anderson
Chicago	Morgan Park Military Academy	Harry D. Abells
Chicago	Francis W. Parker School	Raymond W. Osborne
Chicago	Starrett School for Girls	Gerard T. Smith
Chicago	Stickney School	Stanley M. Durrant

City	Institution	Head
Chicago	University High School	P. B. Jacobsen
Elgin	Elgin Academy	Earl G. Leinbach
Evanston	Marywood School for Girls	Sister Mary Corona
Evanston	Roycemore School	Rebecca S. Ashley
La Grange	Broadview Academy	A. J. Olson
Lake Forest	Ferry Hall	Eloise R. Tremain
Lake Forest	Lake Forest Academy	John W. Richards
Mooseheart	Mooseheart School	W. J. Leinweber
Onarga	Onarga Military School	L. M. Bittinger
Rock Island	Villa De Chantal	Sister Marie
Sycamore	St. Alban's School	Charles L. Street
Winnetka	The North Shore Country Day School	Perry D. Smith

Indiana

Culver	Culver Military Academy	L. R. Gignilliat
Howe	Howe School	Burrett B. Bouton
Indianapolis	Tudor Hall School for Girls, Inc.	I. Hilda Stewart

Iowa

Dubuque	Columbia Academy	Thomas Conry

Kansas

Salina	St. John's Military School	Wm. M. Brown

Kentucky

Lexington	Sayre School for Girls	J. C. Hanley
Louisville	Kentucky Home School for Girls	Annie S. Waters
Louisville	Louisville Collegiate School	Marjorie Hiscox
Lyndon	Kentucky Military Institute	Charles B. Richmond
Millersburg	Millersburg Military Institute	W. R. Nelson
Shelbyville	Science Hill School	Clara Martin Poynter

Louisiana

New Orleans	Gilbert Academy	Margaret Davis Bowen
New Orleans	Louise S. McGehee School	Nina P. Davis, Acting
New Orleans	Metairie Park Country Day School	Ralph F. Boothby
New Orleans	Isidore Newman School	C. C. Henson

Maine

Bethel	Gould Academy	Philip S. Sayles
Charleston	Higgins Classical Institute	Wm. A. Tracy
Dover-Foxcroft	Foxcroft Academy	Frank G. Stone
Fryeburg	Fryeburg Academy	Elroy O. LaCasce
Hebron	Hebron Academy	Ralph L. Hunt
Houlton	Ricker Classical Institute & Junior College	R. M. Hayes
Kents Hill	Kents Hill School	Edward W. Hincks
North Bridgton	Bridgton Academy	H. H. Sampson
Pittsfield	Maine Central Institute	Edwin M. Purinton
Portland	The Waynflete School	Barbara B. Woodruff
Saco	Thornton Academy	E. R. Woodbury
South Berwick	Berwick Academy	Ercell M. Gordon
Vassalboro	Oak Grove School	Robert E. Owen
Waterville	Coburn Classical Institute	Hugh A. Smith

Maryland

Baltimore	Boys' Latin School	Frederick A. Hahn
Baltimore	The Bryn Mawr School	Janet H. Clark
Baltimore	Friends School	Edwin C. Zavitz
Baltimore	Gilman Country School	E. Boyd Morrow
Baltimore	The Girls' Latin School	Nellie M. Wilmot
Baltimore	Greenwood School	Mary A. Elcock
Baltimore	Loyola High School	A. M. Guenther
Baltimore	Mount St. Agnes School	Sister Mary Kathleen
Baltimore	Mt. St. Joseph College High School	Brother Edmund
Baltimore	Notre Dame Preparatory School	Sister M. Ethelbert
Baltimore	The Park School	Hans Froelicher, Jr.
Baltimore	Roland Park Country School	Elizabeth M. Castle
Catonsville	St. Timothy's School	Ella R. Watkins
Charlotte Hall	Charlotte Hall School	B. F. Crowson
Forest Glen	National Park Seminary	James E. Ament
Garrett Park	Georgetown Preparatory School	Henri J. Wiesel
Garrison	Garrison Forest School	Jean G. Marshall
Glencoe	Oldfields School, Inc.	Duncan McCulloch
McDonogh	McDonogh School	Louis E. Lamborn
Port Deposit	The Tome School	Charles J. Keppel
Reisterstown	The Hannah More Academy	Laura Fowler
St. James	St. James School	Adrian H. Onderdonk
Severna Park	Severn School	Rolland M. Teel

Massachusetts

Andover	Abbot Academy	Marguerite Hearsey
Andover	Phillips Academy	Claude Moore Fuess
Ashburnham	Cushing Academy	Clarence P. Quimby
Belmont	Belmont Hill School	Thomas R. Morse
Boston	Boston Academy of Notre Dame	Sister Frances
Boston	The Brimmer School	Mabel Cummings
Boston	Chauncy Hall School	Franklin T. Kurt
Boston	Erskine School	Euphemia E. McClintock
Boston	Huntington School for Boys	Charles H. Sampson
Boston	The May School	Mrs. Chas. H. Haskins
Boston	The Winsor School	Katharine Lord
Brookline	Choate School	Augusta Choate
Brookline	The Rivers School	Clarence E. Allen
Cambridge	The Brown & Nichols School	Roger T. Twitchell
Cambridge	The Buckingham School	Marian W. Vaillant
Cambridge	Manter Hall	Charles M. Underwood
Cambridge	New Preparatory School	Ernest Benshimol
Chestnut Hill	The Beaver Country Day School	Eugene R. Smith
Concord	Concord Academy	Elsie G. Hobson
Concord	Middlesex School	Frederick Winsor
Danvers	St. John's Preparatory School	Brother Aubert
Dedham	Noble & Greenough School	Charles Wiggins
Deerfield	Deerfield Academy	Frank L. Boyden
Easthampton	Williston Academy	Archibald V. Galbraith
East Northfield	Northfield Seminary	Mira B. Wilson
Franklin	Dean Academy	Earle S. Wallace
Groton	Groton School	Endicott Peabody
Groton	Lawrence Academy	Fred Clifton Gray
Hingham	Derby Academy	George F. Cherry
Kendall Green	The Cambridge School, Inc.	John R. D. French
Lowell	Rogers Hall	Katharine W. McGay
Marion	Tabor Academy	Walter H. Lillard
Milton	Milton Academy	Wm. L. W. Field
Mt. Hermon	Mount Hermon School	David R. Porter
Natick	Walnut Hill School	Hester R. Davies
Newton	The Country Day School for Boys of Boston	W. Linwood Chase
North Andover	Brooks School	Frank D. Ashburn
Norton	House in the Pines	Gertrude E. Cornish
Pittsfield	Miss Hall's School	Mira H. Hall
Sheffield	Berkshire School	Seaver B. Buck
Southboro	St. Mark's School	Francis Parkman
South Braintree	Thayer Academy	Stacy B. Southworth
South Byfield	Governor Dummer Academy	Edward W. Eames
Springfield	The MacDuffie School	M. A. MacDuffie
Wellesley	Academy of the Assumption	Sister Maris Stella
Wellesley	Dana Hall School	Dorothy Waldo
West Bridgewater	Howard Seminary & Junior College	Lynn H. Harris
Weston	The Cambridge School	John R. P. French
West Roxbury	Roxbury Latin School	George N. Northrop
Wilbraham	Wilbraham Academy	Charles L. Stevens
Worcester	Bancroft School	Hope Fisher
Worcester	Worcester Academy	Harold H. Wade

Michigan

Bloomfield Hills	Cranbrook School	George T. Nickerson
Bloomfield Hills	Kingswood School Cranbrook	Margaret A. Augur
Detroit	The Liggett School	Katharine Ogden
Detroit	Miss Newman's School	Mary Newman
Grosse Pointe	Detroit University School	Daniel H. Fletcher

Minnesota

Faribault	St. Mary's Hall	Katharine Caley
Faribault	Shattuck School	James S. Guernsey
Minneapolis	The Blake School	Eugene C. Alder
Minneapolis	Minnehaha Academy	J. S. Peterson, Acting
Minneapolis	Northrop Collegiate School	Ethel M. Spurr
Owatonna	Pillsbury Academy	Milo B. Price
St. Paul	Oak Hall	Royal A. Moore
St. Paul	St. Paul Academy	John DeQ. Briggs
St. Paul	The Summit School	Sarah Converse

Mississippi

Blue Mountain	Mississippi Heights Academy	
Gulfport	Gulf Coast Military Academy	Nat Owen
Port Gibson	Chamberlain-Hunt Academy	J. W. Kennedy

City	Institution	Head
Missouri		
Boonville	Kemper Military School	A. M. Hitch
Clayton	John Burroughs School	Leonard D. Haertter
Clayton	Chaminade College High School	V. B. Braun
Columbia	University High School	C. H. Butler
Kansas City	Barstow School	M. Mercer Kendig
Kansas City	Pembroke-Country Day School	Howard A. Jones
Kansas City	Sunset Hill School for Girls	Mary C. Hazard
Lexington	Wentworth Military Academy	J. M. Sellers, Supt.
Mexico	Missouri Military Academy	Charles R. Stribling
Point Lookout	The School of the Ozarks	Carl Cave
St. Louis	Hosmer Hall	Katherine F. Roberts
St. Louis	Mary Institute	Charles H. Garrison
St. Louis	The Principia	Frederic E. Morgan
St. Louis	St. Louis Country Day School	Robert H. B. Thompson
Nebraska		
Omaha	Brownell Hall	Abba W. Bowen
Omaha	School of Individual Instruction, Inc.	Mrs. C. F. Pratt
New Hampshire		
Andover	Proctor Academy	Halsey Gulick
Center Strafford	Austin-Cate Academy	Clarence Cummings
Concord	St. Paul's School	Samuel S. Drury
Derry	Pinkerton Academy	John H. Bell
Exeter	Phillips Exeter Academy	Lewis Perry
Exeter	Robinson Seminary	James A. Pirnie
Kingston	Sanborn Seminary	Clarence E. Amstutz
Meriden	Kimball Union Academy	William R. Brewster
New Hampton	New Hampton	Frederick Smith
Tilton	Tilton School	James E. Coons
Wolfeboro	Brewster Free Academy	Walter G. Grennall, Jr.
New Jersey		
Blairstown	Blair Academy	Charles H. Breed
Bordentown	Bordentown Military Institute	David Styer
Burlington	St. Mary's Hall	Edith M. Weller
Convent	Academy of St. Elizabeth	Sister Marie Josephine
Elizabeth	Pingry School	E. Laurence Springer
Elizabeth	The Vail-Deane School	Esther L. Swenson
Englewood	Dwight School	Frances Leggett
Essex Falls	Kingsley School	Walter D. Gerken
Gladstone	St. Bernard's School	H. D. Nicholls
Hackettstown	Centenary Collegiate Institute	Robert J. Trevorrow
Hightstown	Peddie School	Wilbur E. Saunders
Hoboken	Stevens Hoboken Academy	B. F. Carter
Jersey City	Bergen School for Girls	Louise W. Moora
Lakewood	Newman School	William M. Ayar
Lawrenceville	The Lawrenceville School	Allan V. Heely
Montclair	The Kimberley School	Mary K. Waring
Montclair	Montclair Academy	Walter D. Head
Moorestown	Moorestown Friends School	Chester L. Reagan
Morristown	Morristown School	George H. Tilghman
Newark	Newark Academy	Clinton F. Zerweck
Newark	Newark Preparatory School	Leon Terry
Newark	Prospect Hill Country Day School	Mrs. Laura D. Lamont
New Brunswick	Rutgers Preparatory School	Philip M. B. Boocock
Orange	Miss Beard's School	Lucie C. Beard
Orange	Carteret Academy	George G. Grim
Orange	Dearborn-Morgan School	George L. Shelley
Pennington	Pennington School	Francis Harvey Green
Plainfield	The Hartridge School	Emelyn B. Hartridge
Plainfield	Wardlaw School	C. D. Wardlaw
Princeton	Miss Fine's School	Katherine B. Shippen
Princeton	Hun School	John G. Hun
Summit	Kent Place School	Harriett L. Hunt
Toms River	Admiral Farragut Academy	S. S. Robison, Supt.
Wenonah	Wenonah Military Academy	Charles M. Lorence
New Mexico		
Roswell	New Mexico Military Institute	D. C. Pearson
New York		
Albany	Academy of the Holy Names	Sister M. Judith
Albany	The Albany Academy	Islay F. McCormick
Albany	Albany Academy for Girls	Margaret Trotter
Albany	St. Agnes School	Blanche Pittman
Bronxville	Brantwood Hall	Mary T. Maine
Brooklyn	Adelphi Academy	William Slater
Brooklyn	Berkeley Institute	Ina C. Atwood
Brooklyn	Brooklyn Academy	Charles W. Cortright
Brooklyn	Brooklyn Friends School	S. Archibald Smith
Brooklyn	Brooklyn Preparatory School	John H. Klocke
Brooklyn	Colby Academy	Walter S. Meyer
Brooklyn	Flatbush School	Dwight R. Little
Brooklyn	The Packer Collegiate Institute	John H. Denbigh
Brooklyn	Polytechnic Preparatory Country Day School	Joseph Dana Allen
Brooklyn	Shore Road Academy	Theodora Goldsmith
Buffalo	The Buffalo Seminary	L. Gertrude Angell
Buffalo	The Franklin School	Bertha A. Keyes
Buffalo	Nichols School	Henry G. Gilland
Carmel	Drew Seminary for Young Women	Herbert Wright
Cazenovia	The Cazenovia Seminary	Harold W. Hebblethwaite
Cooperstown	Knox School	Mrs. E. Russell Houghton
Cornwall	New York Military Academy	Milton E. Davis
Dobbs Ferry	The Masters School	Evelina Pierce
Flushing	The Foxwood School	Elizabeth C. Dresser
Forest Hills	Kew-Forest School	Louis D. Marriott
Garden City	Cathedral School of St. Mary	Marion B. Reid
Garden City	St. Paul's School	Walter R. Marsh
Glens Falls	Glens Falls Academy	J. Thacher Sears
Jackson Heights	Garden Country Day School	O. P. Flower
Lake Placid Club	Northwood School	Ira A. Flinner
Lakemont	Palmer Institute-Starkey Seminary	James P. Long
Lima	Genesee Wesleyan Seminary	A. Talmage Schulmaier
Locust Valley	Friends Academy	Alexander M. Blackburn
Manlius	Manlius School	Guido F. Verbeck
Millbrook	The Bennett School	Courtney Carroll
Montour Falls	Cook Academy	Bert C. Cate
New York	Academy Mount Saint Vincent	Sister Maria
New York	All Hallows Institute	P. D. McCarthy
New York	The Barnard School for Boys	William L. Hazen
New York	The Barnard School for Girls	Theodore E. Lyon
New York	Bentley School	Bertha M. Bentley
New York	The Berkeley-Irving School	Louis C. Woodruff
New York	Birch Wathen School	Louise Birch
New York	The Brearley School	Millicent Carey McIntosh
New York	The Calhoun School	Mary E. Calhoun
New York	The Chapin School, Ltd.	Ethel Stringfellow
New York	Collegiate School for Boys	Wilson Parkhill
New York	Columbia Grammar School	Frederic A. Alden
New York	The Dalton Academy	Helen Parkhurst
New York	Dwight School	Ernest Greenwood
New York	Ethical Culture Schools	V. T. Thayer
New York	Franklin School	Clifford W. Hall
New York	Friends Seminary	Henry L. Messner
New York	The Gardner School	M. Elizabeth Masland
New York	The Lenox School	Olivia Green
New York	Lincoln School of Teachers College	Jesse H. Newlon
New York	Horace Mann School	Rollo G. Reynolds
New York	Horace Mann School for Boys	Charles C. Tillinghast
New York	McBurney School	Thomas Hemenway
New York	The Nightingale-Bamford School	Frances N. Nightingale
New York	Rhodes School	David Goodman
New York	The Riverside School	Margaret E. Wells
New York	St. Agatha	Muriel Bowden
New York	St. Ann's Academy for Boys	Brother Paul
New York	The Spence School	Dorothy Brockway
New York	The Todhunter School	Marion Dickerman
New York	Trinity School	Lawrence T. Cole
New York	Walden School	C. Elizabeth Goldsmith
Niagara Falls	DeVeaux School	George L. Barton
Oakdale	La Salle Military Academy	Brother Leo
Pawling	Pawling School	R. J. Shortlidge
Peekskill	The Peekskill Military Academy	John C. Bucher
Peekskill	St. Mary's School	Sister Mary Regina
Poughkeepsie	Oakwood School	William J. Reagan
Riverdale	Riverdale Country School	Frank S. Hackett
Rochester	Allendale School	Barclay H. Farr
Rochester	Columbia Preparatory School	Caroline Milliman
Rochester	The Harley School	Louise M. Sumner
Rye	Rye Country Day School	Morton Snyder
Scarborough	Scarborough School	F. Dean McClusky
Schenectady	The Brown School	Marjorie D. Simpson
Snyder	The Park School of Buffalo	M. A. Cheek, Jr.
Staten Island	Notre Dame Academy	Sister St. Margaret
Staten Island	Staten Island Academy	Stephen J. Botsford
Stony Brook	The Stony Brook School	Frank E. Gaebelein
Syracuse	Goodyear-Burlingame School	Marion S. Edwards
Tarrytown	The Hackley School	Walter B. Gage
Tarrytown	Highland Manor School & Junior College	Eugene H. Lehman
Tarrytown	Irving School	C. W. Olson
Tarrytown	Marymount School	M. St. Clare

City	Institution	Head
Troy	Emma Willard School	Eliza Kellas
Utica	Utica Country Day School	Raymond B. Johnson
Woodmere	Woodmere Academy	Horace M. Perry

North Carolina

Asheville	Asheville School	David R. Fall
Asheville	St. Genevieve-of-the-Pines	Mother Lorin
Beaufort	St. Paul's School	Mrs. N. P. Geffroy
Buie's Creek	Campbell College & Academy	L. H. Campbell
Hendersonville	Fassifern School	Joseph R. Sevier
Oak Ridge	Oak Ridge Military Institute	E. P. Holt
Star	Country Life Academy	George D. Coerbaugh
Washington	Washington Collegiate Institute	Maynard O. Fletcher
Winston Salem	Salem Academy	Mary A. Weaver

North Dakota

Fargo	Oak Grove Seminary	J. E. Fossum

Ohio

Akron	Old Trail School	Eugene M. Hinton
Barnesville	Friends Boarding School	Blanche E. Schofield
Cincinnati	College Preparatory School	Mary Harlan Doherty
Cincinnati	University School	C. L. S. Easton
Cleveland	Hathaway-Brown School	Mary E. Raymond
Cleveland	Laurel School	Edna F. Lake
Cleveland	The University School	Harry A. Peters
Columbus	The Columbus Academy	Frank P. R. Van Syckel
Columbus	The Columbus School for Girls	Grace L. J. McClure
Hudson	Western Reserve Academy	Joel B. Hayden
Mt. St. Joseph	Academy of Mt. St. Joseph	Sister Dorothea
Mt. Vernon	Mt. Vernon Academy	V. P. Lovell
Reading	Mount Notre Dame Academy	Sister Genevieve Marie
Toledo	Maumee Valley Country Day School	Leslie Leland

Oregon

Gaston	Laurelwood Academy	H. R. Miller
Portland	The Catlin School	Jessie T. Powers
Portland	Hill Military Academy	Joseph A. Hill
Portland	St. Helen's Hall	

Pennsylvania

Allentown	Allentown Preparatory School	Louis F. Hackemann
Ardmore	The Holman School	Elizabeth W. Braley
Birmingham	The Birmingham School, Inc.	Thomas C. Grier
Bryn Mawr	The Baldwin School	Elizabeth F. Johnson
Bryn Mawr	The Shipley School	Alice G. Howland
Forty Fort	The Wilkes-Barre Institute	Anna M. Olcott
George School	George School	George A. Walton
Harrisburg	Harrisburg Academy	Arthur E. Brown
Haverford	Haverford School	Edwin M. Wilson
Hollidaysburg	Highland Hall	Elizabeth G. Baldwin
Kingston	Wyoming Seminary	Wilbur H. Fleck
Lancaster	Franklin & Marshall Academy	E. M. Hartman
Lancaster	The Shippen School for Girls	Elizabeth Ross
Latrobe	St. Xavier's Academy	Sister M. Regis
Mercersburg	The Mercersburg Academy	Boyd Edwards
New Bloomfield	Carson Long Institute	Edward L. Holman
Overbrook	The Episcopal Academy	Greville G. Haslam
Overbrook	Friends Central School	Barclay L. Jones
Pennsburg	Perkiomen School	Clarence E. Tobias, Jr.
Philadelphia	Brown Preparatory School	George J. Brown
Philadelphia	Carson College for Orphan Girls	Elsa Ueland
Philadelphia	Chestnut Hill Academy	Frederic E. Camp
Philadelphia	Convent of the Sacred Heart	Mother M. Helen Lucas
Philadelphia	Friends Select School	Walter W. Haviland
Philadelphia	Germantown Academy	Samuel E. Osbourn
Philadelphia	Germantown Friends School	Stanley R. Yarnall
Philadelphia	The Lankenau School	E. F. Bachmann
Philadelphia	Mount St. Joseph Academy	Mother Directress
Philadelphia	Oak Lane Country Day School	J. S. Butterweck
Philadelphia	The William Penn Charter School	Richard Knowles
Philadelphia	Miss Sayward's School	Anne Cutter Coburn
Philadelphia	Springside School	Mrs. Samuel H. Paul
Philadelphia	Stevens School	Helen L. Church
Philadelphia	Temple University High School	Charles E. Metzger
Pittsburgh	Arnold School	Roger B. Merriman, Jr.
Pittsburgh	The Ellis School	Sara Frazer Ellis
Pittsburgh	Shady Side Academy	Harold A. Nomer
Pittsburgh	The University School	Guy H. Baskerville
Pittsburgh	The Winchester-Thurston School	Mary A. G. Mitchell
Pottstown	The Hill School	James I. Wendell
Rydal	Ogontz School	Abby A. Sutherland
Saltsburg	Kiskiminetas Springs School	W. H. MacColl
Susquehanna	Laurel Hill Academy	James A. Walsh
Swarthmore	The Mary Lyon School	Haldy M. Crist
Torresdale	Eden Hall	Mother Helen Lucas
Washington	Washington Seminary	Jane C. Maxfield
Wayne	Valley Forge Military Academy	Milton G. Baker
Westtown	Westtown School	James F. Walker
Williamsport	Williamsport Dickinson Seminary	John W. Long
Wynnewood	The Agnes Irwin School	Bertha M. Laws
Wynnewood	Montgomery School	Gibson Bell
York	York Collegiate Institute	Lester F. Johnson

Rhode Island

East Greenwich	East Greenwich Academy	Ira W. LeBaron
Newport	St. George's School	J. Vaughan Merrick
Portsmouth	Portsmouth Priory School	J. Hugh Diman
Providence	Lincoln School	Frances E. Wheeler
Providence	The Moses Brown School	L. Ralston Thomas
Providence	The Mary C. Wheeler School	Mary Helena Dey

South Carolina

Aiken	Fermata School	E. B. Turnbach
Bamberg	Carlisle School	James F. Risher
Charleston	Ashley Hall	Mary V. McBee
Greenwood	Bailey Military Institute	James D. Fulp

Tennessee

Baxter	Baxter Seminary	Harry L. Upperman
Bell Buckle	Webb School	W. R. Webb
Butler	Watauga Academy	C. A. Todd
Chattanooga	Baylor School	Herbert B. Barks
Chattanooga	Girls' Preparatory School	Tommie P. Duffy
Chattanooga	The McCallie School	S. J. McCallie
Collegedale	Southern Junior College	H. J. Klooster
Columbia	Columbia Military Academy	Wm. O. Batts, Supt.
Franklin	Battle Ground Academy	George I. Briggs
Lebanon	Castle Heights Military Academy	Harry L. Armstrong
Memphis	Miss Hutchison's School	Mary G. Hutchison
Memphis	Memphis University School	Howard G. Ford
Nashville	Peabody Demonstration School	W. H. Yarbrough
Petersburg	Morgan School	R. Kenneth Morgan, Jr.
Pleasant Hill	Pleasant Hill Academy	Oscar M. Fogle
Sevierville	Murphy Collegiate Institute	W. C. Martin
Sewanee	Sewanee Military Academy	William R. Smith
Sweetwater	Tennessee Military Institute	C. R. Endsley

Texas

Bryan	Allen Academy	N. B. Allen
Dallas	The Miss Hockaday School for Girls	Ela Hockaday
Dallas	Terrill Preparatory School & Junior College for Boys	S. M. Davis
El Paso	Radford School for Girls	L. deL. Templin
Houston	Kinkaid School	Margaret H. Kinkaid
Laredo	Holding Institute	Carmen Blessing
San Antonio	Peacock Military Academy	Wesley Peacock, Jr.
San Antonio	St. Mary's Hall	Ruth Coit
San Antonio	Texas Military Institute	W. W. Bondurant
San Marcos	San Marcos Academy	R. M. Cavness

Utah

Salt Lake City	Rowland Hall	Wilfrida Messenger

Vermont

Lyndon Center	Lyndon Institute	O. D. Mathewson
Manchester	Burr & Burton Seminary	Ralph E. Howes
Montpelier	Montpelier Seminary	Arthur W. Hewitt
Putney	Putney School	Mrs. Sebastian Hinton
St. Johnsbury	St. Johnsbury Academy	Stanley R. Oldham
Saxtons River	Vermont Academy	Lawrence G. Leavitt

Virginia

Alexandria	Episcopal High School	A. R. Hoxton
Alexandria	St. Agnes School	Mrs. G. C. Macan
Chatham	Chatham Hall	Edmund J. Lee
Chatham	Hargrave Military Academy	Aubrey H. Camden
Danville	Danville Military Institute	William M. Kemper

City	Institution	Head
Ferrum	Ferrum Training School	J. A. Chapman
Fork Union	Fork Union Military Academy	J. J. Wicker
Fort Defiance	Augusta Military Academy	C. S. Roller
Front Royal	Randolph-Macon Academy	John C. Boggs
Greenway	The Madeira School	Mrs. David Wing
Grundy	Grundy Presbyterian School	Frank B. Clark
Lynchburg	Virginia Episcopal School	Oscar deW. Randolph
Middleburg	Foxcroft School	Charlotte H. Noland
Richmond	The Collegiate School for Girls	Mary D. Ruffin
Richmond	McGuire's University School	John P. McGuire
Staunton	Staunton Military Academy	Emory J. Middour
Staunton	Stuart Hall	Ophelia S. T. Carr
Warrenton	Warrenton Country School	Lea M. Bouligny
Waynesboro	Fairfax Hall	W. B. Gates
Waynesboro	Fishburne Military School	M. H. Hudgins
Richmond	St. Catherine's School	Louisa de B. B. Brackett
Richmond	St. Christopher's School	C. G. Chamberlayne
Woodberry Forest	Woodberry Forest School	J. Carter Walker
Woodstock	Massanutten Academy	H. J. Benchoff

City	Institution	Head
Washington		
Seattle	Helen Bush School	Helen T. Bush
Seattle	Saint Nicholas School	Fanny C. Steele
Tacoma	Annie Wright Seminary	Sallie E. Wilson
West Virginia		
Lewisburg	Greenbrier Military School	H. B. Moore
Wisconsin		
Delafield	St. John's Military Academy	Roy F. Farrand
Kenosha	Kemper Hall	Sister Mary Ambrose
Lake Geneva	Northwestern Military & Naval Academy	R. P. Davidson
Milwaukee	Milwaukee Country Day School	A. Gledden Santer
Milwaukee	Milwaukee-Downer Seminary	Helen K. Burtt
Milwaukee	Milwaukee University School	Frank L. Spigener
Prairie du Chien	Campion Jesuit High School	J. C. Friedl

WPA Means Much to the Schools of the Nation

BY MAURICE JUDD

Information Service, Works Progress Administration, Washington, D. C.

OPENING of grade and high schools in the fall of 1936 throughout the nation found nearly 30,000,000 pupils in attendance.

They returned to school buildings in hundreds of communities which have been built, enlarged, or renovated as projects of the Works Progress Administration.

Nearly one in six of all school buildings in the United States benefited from WPA projects involving construction or improvement, figures of the WPA's Division of Research, Statistics and Records reveal. Under the WPA program and those of its predecessors, the Civil Works Administration and the Federal Emergency Relief Administration, 5,825 new schools were constructed and 84,940 were improved or repaired.

Great strides had been made in the construction, repair or improvement of schools by both the CWA and the FERA prior to the beginning of the WPA. The WPA record, according to latest reports, shows 7,498 projects for the building of educational buildings, which includes all types of public schools, as well as the construction, repair, or improvement of such structures as dormitories, laboratories, school-bus waiting stations, etc. Of these projects, 2,984 were actively in progress during the fall months of 1936, and 4,514 had been completed or were inactive. The total estimated cost of all educational building projects was $102,797,785, of which $80,577,819 was provided through the WPA, while local sponsors of the projects agreed to pay $22,219,966, for materials and supervision. With certain rare exceptions, all presently active projects are expected to be completed by June 30, 1937.

The number of children in the rural districts who could not get to school during bad weather because of the condition of the roads is not known, but certainly it was extremely large. Under the WPA, CWA and FERA, more than 400,000 miles of farm-to-market roads have been built or improved so that they are passable in all weather, enabling children to go to school who formerly would have been compelled to remain at home on the occasion of every hard rain or snow.

Hundreds of school-bus waiting stations have been built or repaired to make them waterproof to insure the attendance of children of the rural schools in bad weather.

Aside from the benefits accruing to school children from the WPA school construction and improvement program, nearly 2,000,000 pupils among this year's estimated attendance are receiving hot lunches as a result of another project activity of the Works Progress Administration.

Under another phase of the Federal Works Program, approximately 225,000 pupils are being enabled to remain in high school solely because of part-time employment-assistance given them on projects of the National Youth Administration.

Thousands of other children, the preponderance being in the urban centers, were compelled to stay away from school because they did not have decent or sufficient clothes to wear. That condition has been remedied in a great majority of the cases by clothing made by 250,000 WPA women workers on sewing projects, who have made, among many other useful things, garments of all kinds for distribution to the children of families on relief.

Just how much of the whole school attendance and the increased attendance is due to the completion of projects of the WPA and its predecessors would be exceedingly difficult to estimate. There is no way of telling how many pupils would have been withdrawn from the schools had not their parents been employed on WPA projects. But it is certain that the school construction and improvement program provided facilities for many thousands of pupils who had never had them before. It has made possible full-time school attendance for thousands of children who formerly attended only part-time, and it has enabled additional thousands of youngsters to attend school under more pleasant and favorable circumstances than heretofore.

SECTION XIV

SUPERINTENDENTS OF SCHOOLS IN PLACES OF 5000 POPULATION AND OVER

In the following list are included all places which are known to have a superintendent of schools and which, according to the 1930 Federal Census, have a population of 5,000 or over. These include incorporated cities, towns, boroughs and villages, unincorporated towns (in New England), and townships classified as urban by the Bureau of the Census. The names of the superintendents have been revised to December, 1936, and in some cases more recently.

References

(a) County superintendent. (b) Parish superintendent.

City	*Superintendent*
Alabama	
Andalusia	C. L. Martin
Anniston	C. C. Moseley
Bessemer	J. C. Orr
Birmingham	C. B. Glenn
Decatur	W. W. Benson
Dothan	Bruce Flurry
Eufaula	T. G. Wilkinson
Fairfield	B. B. Baker
Florence	J. W. Powell
Gadsden	C. A. Donehoo
Homewood	(No local board of education)
Huntsville	W. G. Hamm
Jasper	G. T. Patrick
Lanett	Taylor H. Kirby
Mobile	W. C. Griggs
Montgomery	C. M. Dannelly
Opelika	R. B. Mardre
Phenix City	L. P. Stough
Selma	P. M. Munro
Sheffield	L. E. Creel
Talladega	Ben. S. Copeland
Tarrant	W. A. Parker
Troy	L. D. Bynum
Tuscaloosa	H. G. Dowling
Arizona	
Bisbee	R. E. Souers
Douglas	J. E. Carlson, Jr.
Globe	H. E. Stevenson
Miami	Ivan P. Hostetter
Morenci	W. E. Lutz
Nogales	A. J. Mitchell
Phoenix	John D. Loper
Prescott	Donald Sheldon
Tucson	C. E. Rose
Arkansas	
Blytheville	W. D. McClurkin
Camden	F. W. Whiteside
Conway	B. A. Short
El Dorado	J. I. McClurkin
Fayetteville	Frank S. Root
Fort Smith	J. W. Ramsey
Helena	J. F. Wahl
Hope	Miss Beryl Henry
Hot Springs National Park	Harvey H. Haley
Jonesboro	R. H. Moore
Little Rock	R. C. Hall
Malvern	J. L. Pratt
No. Little Rock	T. H. Alford
Paragould	C. S. Blackburn
Pine Bluff	J. R. Allen
Russellville	E. W. Bass
Texarkana	P. N. Bragg
Van Buren	D. M. Riggin
California	
Alameda	Wm. G. Paden
Albany	John Franklin West
Alhambra	Geo. E. Bettinger
Anaheim	M. A. Gauer (Elementary) J. A. Clayes (High)
Arcadia	Elmer E. Westerhouse
Bakersfield	L. E. Chenoweth
Berkeley	Virgil E. Dickson
Beverly Hills	E. J. Hummel
Brawley	Geo. K. Anderson
Burbank	B. F. Enyeart
Burlingame	L. D. Henderson
Calexico	J. W. Lawson
Chico	F. L. Cummings
Colton	J. H. Waldron
Compton	Ardella B. Tibbey
Corona	Frank E. Bishop
Coronado	
Culver City	Bessie O. Brown
Daly City	R. L. Crane
El Centro	Guy A. Weakley
Eureka	G. B. Albee
Fresno	O. S. Hubbard
Fullerton	R. E. Green
Glendale	R. D. White
Hanford	C. E. Denham
Hawthorne	Herman A. Buckner
Hayward	Robert M. Reid
Inglewood	George M. Green (High) Robert E. Cralle (Elementary)
Lodi	LeRoy Nichols
Long Beach	Will French
Los Angeles	Vierling Kersey
Lynwood	Harry A. Lintz
Martinez	Forrest V. Routt
Marysville	W. A. Kynoch
Merced	W. M. Smith (Elementary) A. W. Meany (High)
Modesto	J. H. Bradley
Monrovia	J. Warren Ayer
Montebello	Mark R. Jacobs
Monterey	J. R. Croad (Elementary) J. R. McKillop (High)
Napa	Irene Snow
National City	Fred M. Tonge (Elementary) J. M. McDonald (High)
Oakland	E. W. Jacobsen
Ontario	C. W. Randall
Orange	Carl Thomas
Oxnard	R. B. Haydock
Pacific Grove	R. H. Down
Palo Alto	J. R. Overturf
Pasadena	J. A. Sexson
Petaluma	David M. Durst
Piedmont	Harry W. Jones
Pittsburg	F. S. Ramsdell
Pomona	Emmett Clark
Porterville	Emmett R. Berry
Redlands	H. G. Clement
Redondo Beach	F. F. Martin (Elementary) Aileen S. Hammond (High)
Redwood City	John Gill
Richmond	W. T. Helms
Riverside	Ira C. Landis
Roseville	W. T. Eich
Sacramento	C. C. Hughes
Salinas	R. D. Case
San Bernardino	Albert D. Graves
San Diego	Will C. Crawford
San Francisco	J. P. Nourse
San Gabriel	R. B. Walter
San Jose	W. L. Bachrodt
San Leandro	Andrew J. Cartwright
San Luis Obispo	Charles E. Teach
San Mateo	George W. Hall (Elementary) Homer Martin (High)
San Rafael	O. R. Hartzell
Santa Ana	Frank A. Henderson
Santa Barbara	Curtis E. Warren
Santa Clara	S. J. Brainerd
Santa Cruz	C. R. Holbrook
Santa Maria	Robert Bruce (Elementary) Andrew P. Hill, Jr. (High)
Santa Monica	Percy R. Davis
Santa Paula	George A. Bond
Santa Rosa	Jerome O. Cross
South Pasadena	George C. Bush
South San Francisco	
Stockton	Ansel S. Williams
Taft	James A. Joyce
Tulare	W. B. Knokey
Vallejo	Elmer L. Cave
Ventura	
Visalia	DeWitt Montgomery
Watsonville	T. S. MacQuiddy
Whittier	Will Wiley (Elementary) D. A. Stouffer (High)
Woodland	T. L. Whitehead
Colorado	
Alamosa	G. P. Young
Boulder	Virgil M. Rogers
Canon City	L. L. Beahm
Colorado Springs	H. M. Corning
Denver	A. L. Threlkeld
Durango	Emory E. Smiley
Englewood	R. D. Jenkins
Fort Collins	Ward I. Miller
Grand Junction	R. E. Tope
Greeley	Hubert D. Eldridge
La Junta	G. T. Wilson
Longmont	Kent L. Sanborn
Loveland	R. W. Truscott
Pueblo	District No. 1, J. H. Risley District No. 20, Ray E. Redmond

City	Superintendent
Salida	L. D. Hightower
Sterling	R. R. Knowles
Trinidad	William R. Ross
Walsenburg	S. M. Andrews

Connecticut

Ansonia	John J. Stevens
Berlin twp. (Address Kensington)	Calvin E. Wilcox
Bridgeport	Worcester Warren
Bristol	Karl A. Reiche
Danbury	Harold F. Dow
Darien	Edward H. Fuller
Derby	Richard T. Tobin
E. Hartford	P. S. Barnes
E. Haven	W. E. Gillis
Enfield	E. H. Parkman
Fairfield	A. M. McCullough
Glastonbury	Francis S. Knox
Greenwich	Edwin C. Andrews
Griswold	Ernest Lake
Groton	S. B. Butler
Hamden	Margaret L. Keefe
Hartford	Fred D. Wish, Jr.
Killingly	W. E. Parker
Manchester	Arthur H. Illing
Meriden	Nicholas Moseley
Middletown	Fred W. Shearer
Middletown (twp.)	Van Buren Moody
Milford	C. W. Maddocks
Naugatuck	H. E. Chittenden
New Britain	S. H. Holmes
New Haven	John C. McCarthy
New London	Warren A. Hanson
Norwalk	Philip A. Jakob
Norwich	E. J. Graham
Plainfield	J. L. Chapman
Plainville	Harold W. Thomas
Plymouth	H. S. Fisher
Putnam	Carl M. Diefenbach
Seymour	R. C. Clark
Shelton	Harry E. Fowler
Southington	William Strong
Stafford	Earl M. Witt
Stamford	Leon C. Staples
Stonington	W. B. Noyes
Stratford	E. Ward Ireland
Torrington	G. J. Vogel
Vernon	H. O. Clough
Wallingford	H. M. Jeffords
Waterbury	Thomas J. Condon
Watertown	G. C. Swift
West Hartford	Lloyd H. Bugbee
West Haven	Seth G. Haley
Westport	Heath E. White
Wethersfield	Wilson Greer
Windham	Egbert A. Case
Windsor	Earle S. Russell
Winsted	L. R. McKusick

Delaware

Wilmington	S. M. Stouffer

District of Columbia

Washington	Frank W. Ballou

Florida

Bartow	C. I. Hollingsworth (a)
Bradenton	Jessie P. Miller (a)
Clearwater	G. V. Fuguitt (a)
Coral Gables. (Address Miami)	J. T. Wilson (a)
Daytona Beach. (Address Deland)	G. W. Marks (a)
Deland	G. W. Marks (a)
Fort Lauderdale	Ulric J. Bennett (a)
Fort Myers	Harry F. Hendry (a)
Gainesville	Horace F. Zetrouer (a)
Jacksonville	R. C. Marshall (a)
Key West	M. E. Russell (a)
Lakeland (Address Bartow)	C. I. Hollingsworth (a)
Lake Worth. (Address W. Palm Beach)	John I. Leonard (a)
Miami	Charles M. Fisher
Miami Beach. (Address Miami)	J. T. Wilson (a)
Ocala	Don T. Mann (a)
Orlando	Judson B. Walker (a)
Palatka	W. W. Carter
Panama City	A. L. Hardy (a)
Pensacola	J. H. Varnum (a)
Plant City. (Address Tampa)	E. L. Robinson (a)
River Junction. (Address Quincy)	C. H. Gray (a)
St. Augustine	D. D. Corbett (a)
St. Petersburg. (Address Clearwater)	G. V. Fuguitt (a)
Sanford	T. W. Lawton (a)
Sarasota	T. W. Yarbrough (a)
Tallahassee	F. S. Hartsfield
Tampa	M. W. Carothers
West Palm Beach	John I. Leonard (a)
Winter Haven. (Address Bartow)	C. I. Hollingsworth (a)

Georgia

Albany	R. E. Brooks
Americus	J. E. Mathis
Athens	B. M. Grier
Atlanta	W. A. Sutton
Augusta	S. D. Copeland
Bainbridge	E. G. Elcan
Brunswick	G. W. Wannamaker
Carrollton	M. C. Wiley
Cartersville	W. H. Brandon
Cedartown	J. E. Purks
Columbus	R. B. Daniel
Cordele	D. H. Standard
Dalton	J. W. Williams
Decatur	Lamar Ferguson
Dublin	A. J. Hargrove
East Point	Paul West
Fitzgerald	W. W. Stancil
Gainesville	C. J. Cheves
Griffin	J. L. Fortney
Lagrange	F. F. Rowe
Macon	W. P. Jones
Marietta	C. A. Keith
Milledgeville	G. S. Roach
Moultrie	J. L. Yaden
Newnan	C. B. Mathews
Rome	B. F. Quigg
Savannah	O. B. Strong
Thomasville	B. B. Broughton
Valdosta	A. G. Cleveland
Waycross	Ralph Newton

Idaho

Boise	W. D. Vincent
Coeur d'Alene	G. O. Phippeny
Idaho Falls	W. W. Christensen
Lewiston	Glenn W. Todd
Nampa	J. E. Walsh
Pocatello	E. Norman Vaughn
Twin Falls	W. B. Smith

Illinois

Alton	W. R. Curtis
Argo-Summit	Clarence Barrett
Aurora	K. D. Waldo (East Side) C. E. Larson (West Side)
Batavia	H. C. Storm
Beardstown	W. L. Gard
Belleville	H. V. Calhoun
Belvidere	R. E. Garrett
Benton	Charles M. Johnson
Berwyn	William Hawkes (Dist. No. 98) E. W. Martin (Dist. No. 100)
Bloomington	James A. Lindsay
Blue Island	H. L. Richards
Brookfield	E. N. Cassady
Cairo	Leo C. Schultz
Calumet City	Eric E. Brown
Canton	Ben Kietzman
Carbondale	Raymond Hoffner
Centralia	R. V. Jordon
Champaign	V. L. Nickell
Charleston	U. B. Jeffries
Chicago	Wm. H. Johnson
Chicago Heights	Ben A. Sylla
Cicero	G. A. Schwebel
Clinton	Arthur Verner
Collinsville	C. H. Dorris
Danville	C. E. Vance
Decatur	William Harris
De Kalb	F. W. Phillips
Des Plaines	E. R. Selleck
Dixon	A. H. Lancaster
Downers Grove	George De Wolf
Duquoin	Joe Strickler
East Moline	D. B. Hoffman
East Peoria	Paul L. Bolin
East St. Louis	D. Walter Potts
Edwardsville	W. W. Krumsiek
Elgin	Theodore Saam
Elmhurst	V. L. Beggs
Elmwood Park	George N. Wells
Evanston	J. R. Skiles (Dist. No. 75) David E. Walker (Dist. No. 76)
Forest Park	W. S. Dimmett
Freeport	B. F. Shafer
Galesburg	O. O. Young
Gillespie	J. W. White
Glencoe	Paul J. Misner
Glen Ellyn	S. A. Denison
Granite City	A. M. Wilson
Harrisburg	W. Russell Malan
Harvey	C. C. Thompson
Herrin	John R. Creek
Highland Park	R. H. Price (Dist. No. 107) Clark G. Wright (Dist. No. 108)
Hinsdale	Martin B. Travis
Hoopeston	W. R. Lowery
Jacksonville	R. O. Stoops
Johnston City	Earl E. Miller
Joliet	H. Ambrose Perrin
Kankakee	Irving Munson
Kewanee	Charles A. Bruner
La Grange	J. C. Davies
Lake Forest	Melvin G. Davis
La Salle	J. B. McManus
Lawrenceville	M. N. Todd
Lincoln	D. F. Nichols
Litchfield	Allen J. Black
Lombard	Mrs. Ada Manning
Macomb	C. S. Chappelear
Madison	E. W. Heob
Marion	H. O. Belford
Mattoon	H. B. Black
Maywood	Eugene La Rowe
Melrose Park	Eugene La Rowe
Metropolis	C. J. Ramsay
Moline	E. P. Nutting
Monmouth	Roy Fetherston
Morris	B. R. Bowden
Mount Carmel	R. S. Condrey
Mount Vernon	H. E. Bosley
Murphysboro	Wm. H. Carruthers
Naperville	R. E. Beebe
Niles Center	R. E. Cotanche
Normal	Monroe Melton
North Chicago	F. E. De Yoe (Dist. No. 63) R. L. Newenham (Dist. No. 64)
Oak Park	W. J. Hamilton
Olney	C. T. Cramer
Ottawa	C. J. Byrne
Pana	H. L. Hart
Paris	John R. Moss
Park Ridge	Harry D. Winslow
Pekin	C. B. Smith
Peoria	E. C. Fisher
Peru	C. W. Martin
Pontiac	A. F. Speltz
Quincy	W. H. Lemmel
River Forest	Ray E. Cheney
Riverside	L. J. Hauser
Rockford	W. W. Ankenbrand
Rock Island	S. H. Berg
St. Charles	G. E. Thompson
Savanna	W. D. Waldrip
Springfield	Wm. J. Lowry

City	Superintendent
Spring Valley	James Nesti
Sterling	O. A. Fackler (Dist. No. 11) H. U. Challand (Dist. No. 10)
Streator	H. K. Whittier
Taylorville	G. W. Wilcockson
Urbana	T. H. Cobb
Venice	J. H. Gore
Villa Park	H. E. Hinkel
Waukegan	John S. Clark
West Frankfort	C. A. Waller
Wheaton	K. K. Tibbetts
Wilmette	J. R. Harper
Winnetka	C. W. Washburne
Wood River	G. A. Smith
Woodstock	W. J. Calahan
Zion	Edgar T. Stephens
Indiana	
Anderson	Arthur Campbell
Auburn	H. L. McKenney
Bedford	Warren J. Yount
Bicknell	Harold Axe
Bloomington	H. E. Binford
Bluffton	O. M. Craig
Brazil	C. P. Keller
Clinton	E. C. Boyd
Columbus	Donald Du Shane
Connersville	E. C. Dodson
Crawfordsville	M. C. Darnall
Decatur	Walter J. Krick
East Chicago	Roy Feik
Elkhart	J. F. Wiley
Elwood	William F. Smith
Evansville	Ralph Irons
Fort Wayne	Merle Abbett (c)
Frankfort	M. N. O'Bannon
Franklin	R. W. Sheek
Gary	William A. Wirt
Goshen	Ort L. Walters
Greensburg	Elmer C. Jerman
Hammond	L. L. Caldwell
Hartford City	H. Paul Kelsay
Hobart	J. M. Sellers
Huntington	C. E. Byers
Indianapolis	Paul C. Stetson
Jeffersonville	E. G. McCullum
Kendallville	H. M. Dixon
Kokomo	C. V. Haworth
Lafayette	Morris McCarty
La Porte	E. B. Wetherow
Lebanon	Paul Van Riper
Linton	T. J. Beecher
Logansport	W. L. Sprouse
Madison	E. O. Muncie
Marion	Elbert E. Day
Michigan City	Milo C. Murray
Mishawaka	P. C. Emmons
Mount Vernon	J. G. Turner
Muncie	H. B. Allman
New Albany	C. B. McLinn
New Castle	E. J. Llewelyn
Peru	J. P. Crodian
Plymouth	Ray Kuhn
Portland	J. C. Webb
Princeton	G. E. Derbyshire
Richmond	W. G. Bate
Rushville	L. A. Lockwood
Seymour	N. J. Lasher
Shelbyville	W. F. Loper
South Bend	Frank E. Allen
Sullivan	Dale C. Billman
Terre Haute	George C. Carroll
Valparaiso	Roy B. Julian
Vincennes	V. L. Eikenberry
Wabash	O. J. Neighbours
Warsaw	James M. Leffel
Washington	N. E. Helderman
West Lafayette	F. A. Burtsfield
Whiting	W. W. Borden
Iowa	
Ames	Jordan L. Larson
Atlantic	J. P. Street
Boone	G. S. Wooten
Burlington	W. G. Brooks
Cedar Falls	J. H. Peet
Cedar Rapids	Arthur Deamer
Centerville	E. W. Fannon
Chariton	J. R. Cougill
Charles City	P. C. Lapham
Cherokee	J. C. Hoglan
Clinton	C. W. Brown
Council Bluffs	J. A. True
Creston	Burton R. Jones
Davenport	Irvin H. Schmitt
Des Moines	A. W. Merrill, Acting
Dubuque	E. D. Cline
Fairfield	W. G. Pence
Fort Dodge	K. D. Miller
Fort Madison	A. I. Tiss
Iowa City	I. A. Opstad
Keokuk	R. L. Reid
Marshalltown	W. F. Shirley
Mason City	R. B. Irons
Muscatine	N. D. McCombs
Newton	B. C. Berg
Oelwein	G. B. Ferrell
Oskaloosa	R. B. Newman
Ottumwa	Frank W. Downa
Perry	J. S. Vanderlinden
Red Oak	J. R. Inman
Shenandoah	W. Dean McKee
Sioux City	L. W. Feik
Spencer	H. J. Williams
Waterloo	J. M. Logan (East Side) Charles A. Kittrell (West Side)
Webster City	Burrus E. Beard
Kansas	
Abilene	F. C. Gardner
Arkansas City	C. E. St. John
Atchison	W. D. Wolfe
Chanute	L. H. Petit
Coffeyville	K. W. McFarland
Concordia	E. B. Allbaugh
Dodge City	A. G. Schroedermeier
Eldorado	J. F. Hughes
Emporia	W. M. Richards
Fort Scott	V. M. Liston
Galena	J. J. Whitehead
Garden City	Ira O. Scott
Great Bend	H. C. Scarborough
Hutchinson	J. W. Gowans
Independence	J. H. Clement
Iola	John Fleming
Junction City	W. A. Wood
Kansas City	F. L. Schlagle
Lawrence	C. E. Birch
Leavenworth	I. J. Bright
Liberal	N. B. Mahuron
Manhattan	W. E. Sheffer
McPherson	R. W. Potwin
Newton	J. B. Heffelfinger
Ottawa	G. H. Marshall
Parsons	R. H. Hughes
Pittsburg	M. M. Rose
Pratt	Amos W. Glad
Salina	W. S. Heusner
Topeka	A. J. Stout
Wellington	Claude Kissick
Wichita	L. W. Mayberry
Winfield	Evan E. Evans
Kentucky	
Ashland	W. L. Brooker
Bellevue	W. H. Marshall, Acting
Bowling Green	T. C. Cherry
Catlettsburg	J. T. Miracle
Corbin	G. W. Campbell
Covington	G. O. Swing
Danville	L. C. Bosley
Dayton	Olin W. Davis
Fort Thomas	D. W. Bridges
Frankfort	J. W. Ireland
Glasgow	W. H. Sugg
Hazard	R. T. Whittinghill
Henderson	C. E. Dudley
Hopkinsville	Gladstone Koffman
Jenkins	C. V. Snapp
Lexington	Henry H. Hill
Louisville	
Ludlow	J. S. Brown
Madisonville	Harper Gatton
Mayfield	K. R. Patterson
Maysville	John Shaw
Middlesboro	J. W. Bradner
Newport	A. D. Owens
Owensboro	J. L. Foust
Paducah	H. L. Smith
Paris	Lee Kirkpatrick
Richmond	W. F. O'Donnell
Somerset	P. H. Hopkins
Winchester	B. B. Hodgkin
Louisiana	
Alexandria	H. M. Wells (b)
Bastrop	E. D. Shaw (b)
Baton Rouge	C. B. Turner (b)
Bogalusa	J. N. Herrington
Crowley	A. T. Browne (b)
Gretna	J. C. Ellis (b)
Hammond	C. C. Pittman (b)
Houma	H. L. Bourgeois (b)
Lafayette	J. W. Faulk (b)
Lake Charles	Ward Anderson
Minden	J. E. Pitcher
Monroe	E. L. Neville
Morgan City	L. A. Law (b)
New Iberia	L. G. Porter (b)
New Orleans	Nicholas Bauer (b)
Opelousas	W. C. Perrauet
Plaquemine	L. P. Terrebonne (b)
Shreveport	E. W. Jones (b)
West Monroe	T. O. Brown (b)
Maine	
Auburn	G. R. Gardner
Augusta	F. W. Burrill
Bangor	I. W. Small
Bath	C. D. Wilson
Belfast	Horatio S. Reed
Biddeford	A. A. Garcelon
Brewer	H. R. Houston
Brunswick	Leon P. Spinney
Calais	Alden Allen
Caribou	G. M. Carter
Gardiner	A. R. Carter
Houlton	Philip H. Woodworth
Lewiston	C. W. Bickford
Millinocket	W. M. Marr
Oldtown	W. O. Chase
Portland	W. B. Jack
Presque Isle	R. J. Carpenter
Rockland	George J. Cumming
Rumford	L. E. Williams
Saco	H. C. Hull
Sanford	J. A. Hamlin
Skowhegan	W. B. Woodbury
South Portland	L. C. Day
Waterville	C. E. Glover
Westbrook	Guy Sinclair
Maryland	
Annapolis	George Fox (a)
Baltimore	D. E. Weglein
Cambridge	J. B. Noble (a)
Cumberland	C. L. Kopp (a)
Frederick	E. W. Pruitt (a)
Frostburg (Address Cumberland)	C. L. Kopp (a)
Hagerstown	B. J. Grimes (a)
Salisbury	J. M. Bennett (a)
Tacoma Park (Address Rockville)	Edwin W. Broome (a)
Massachusetts	
Abington	C. A. Record
Adams	J. F. Farrell
Agawam	B. J. Phelps
Amesbury	Fred C. English
Amherst	L. L. Dudley
Andover	H. C. Sanborn
Arlington	C. H. Dempsey
Athol	G. S. Goodell
Attleboro	L. A. Fales
Auburn	C. M. Harris
Barnstable	R. R. Barr
Belmont	F. A. Scott
Beverly	Starr M. King
Billerica	E. C. Vining
Boston	P. T. Campbell

City	Superintendent
Braintree	C. E. Fisher
Bridgewater	John C. Davis
Brockton	J. F. Scully
Brookline	E. R. Caverly
Cambridge	M. E. Fitzgerald
Canton	A. S. Ames
Chelmsford	G. S. Wright
Chelsea	G. C. Francis
Chicopee	J. J. Desmond, Jr.
Clinton	T. F. Gibbons
Concord	W. A. Hall
Danvers	I. G. Smith
Dartmouth	A. R. Paull
Dedham	J. C. Anthony
Dracut	C. L. Randall
Easthampton	H. D. Casey
Easton	G. C. Mann
Everett	F. A. Ashley
Fairhaven	C. F. Prior
Fall River	H. L. Belisle
Fitchburg	Jerome Burtt
Foxborough	Chase McArthur
Framingham	Lyman R. Allen
Franklin	A. W. Hale
Gardner	F. T. Reynolds
Gloucester	E. W. Fellows
Grafton	A. S. Cole
Great Barrington	R. H. Bellows
Greenfield	F. W. Porter
Haverhill	A. I. Clow
Hingham	O. K. Collins
Holyoke	W. R. Peck
Hudson	E. J. Harriman
Ipswich	Nathaniel N. Love
Lawrence	B. M. Sheridan
Leominster	W. H. Perry
Lexington	T. S. Grindle
Lowell	V. M. McCartin
Ludlow	P. R. Baird
Lynn	H. S. Gruver
Malden	F. G. Marshall
Mansfield	Bert L. Merrill
Marblehead	James W. Vose
Marlboro	E. P. Carr
Maynard	J. P. King
Medford	J. S. Kadesch
Melrose	H. H. Stuart
Methuen	L. H. Conant
Middleboro	J. S. Cushing
Milford	A. O. Caswell
Millbury	C. C. Ferguson
Milton	H. F. Turner
Montague	J. S. Keating
Natick	C. R. Hall
Needham	Harry A. Brown
New Bedford	A. P. Keith
Newburyport	C. R. Thibadeau
Newton	Julius Warren
North Adams	G. C. Bowman
Northampton	
North Andover	F. E. Pitkin
North Attleboro	G. W. Morris
Northbridge	H. J. Phipps
Norwood	Lincoln D. Lynch
Orange	E. C. Hempel
Palmer	C. H. Hobson
Peabody	Wm. A. Welch
Pittsfield	Edward J. Russell
Plymouth	A. B. Handy
Quincy	J. N. Muir
Randolph	A. O. Christiansen
Reading	Arthur E. Pierce
Revere	C. F. Lindstol
Rockland	R. S. Esten
Salem	G. M. Bemis
Saugus	Vernon W. Evans
Shrewsbury	M. A. Sturtevant
Somerset	H. F. Bates
Somerville	E. W. Ireland
Southbridge	Fuller L. Austin
South Hadley	R. D. Tucker
Spencer	I. H. Agard
Springfield	John E. Granrud
Stoneham	C. E. Varney
Stoughton	Warren B. Lyman
Swampscott	Frank L. Mansur
Taunton	W. A. Mowry
Tewksbury	S. G. Bean
Uxbridge	A. B. Garcelon
Wakefield	W. B. Atwell
Walpole	A. C. Jones
Waltham	W. H. Slayton
Ware	W. R. Barry
Wareham	Bion C. Merry
Watertown	W. H. Price
Webster	J. A. Lobban
Wellesley	Edwin H. Miner
Westboro	J. H. Armstrong
Westfield	C. D. Stiles
West Springfield	J. R. Fausey
Weymouth	P. T. Pearson
Whitman	F. E. Holt
Winchendon	C. A. Mitchell
Winchester	J. J. Quinn
Winthrop	E. R. Clarke
Woburn	Daniel P. Hurld
Worcester	W. S. Young

Michigan

Adrian	Ernest J. Reed
Albion	Don Harrington
Alma	F. R. Phillips
Alpena	Russel Wilson
Ann Arbor	O. W. Haisley
Battle Creek	Eldon C. Geyer
Bay City	Ben Klager
Benton Harbor	S. C. Mitchell
Berkeley	R. B. French
Birmingham	Howard Crull, Acting
Cadillac	B. C. Shankland
Charlotte	Jay Dykhouse
Coldwater	J. T. Symons
Dearborn	Ray H. Adams
Detroit	Frank Cody
Dowagiac	C. M. Horn
East Detroit	John Kantner
Ecorse	C. J. Miller
Escanaba	John A. Lemmer
Ferndale	E. F. Down
Flint	L. H. Lamb
Gladstone	A. R. Watson
Grand Haven	E. H. Babcock
Grand Rapids	A. W. Krause, Acting
Grosse Pointe	S. M. Brownell
Grosse Pointe Park	S. M. Brownell
Hamtramck	M. A. Kopka
Hancock	J. E. Hardimon
Hastings	D. A. Van Buskirk
Highland Park	I. M. Allen
Hillsdale	B. L. Davis
Holland	E. E. Fell
Ionia	A. A. Rather
Iron Mountain	John Jelsch
Ironwood	Arthur E. Erickson
Ishpeming	C. L. Phelps
Jackson	Harold Steele
Kalamazoo	Herold C. Hunt
Kingsford	Frank C. Sweeney
Lansing	J. W. Sexton
Lapeer	E. E. Irwin
Lincoln Park	Leo W. Huff
Ludington	H. H. Hawley
Manistee	D. L. Wilde
Manistique	A. F. Hall
Marquette	W. M. Whitman
Marshall	H. W. Holmes
Menominee	J. L. Silvernale
Midland	J. J. Schafer
Monroe	George T. Cantrick
Mount Clemens	L. W. Fast
Mount Pleasant	G. E. Ganiard
Muskegon	John A. Craig
Muskegon Heights	W. R. Booker
Negaunee	H. S. Doolittle
Niles	F. W. Crawford
Owosso	E. J. Willman
Petoskey	H. C. Spitler
Pontiac	James H. Harris
Port Huron	L. A. Packard
River Rouge	A. McDonald
Roseville	E. E. Crampton
Royal Oak	N. J. Quickstad
Saginaw	C. F. Miller
St. Clair Shores	L. S. Lindsey
St. Joseph	E. B. Holden
Sault Ste. Marie	G. G. Malcolm
Sturgis	Waldo Adams
Three Rivers	Walter Horst
Traverse City	Lars Hockstad
Wyandotte	F. W. Frostic
Ypsilanti	E. H. Chapelle

Minnesota

Albert Lea	H. R. Peterson
Austin	S. T. Neveln
Bemidji	J. W. Smith
Brainerd	W. C. Cobb
Chisholm	J. P. Vaughan
Cloquet	E. B. Anderson
Columbia Heights	H. C. Nelson
Crookston	L. M. Wikre
Duluth	H. H. Eelkema
Ely	Stanley Adkins
Eveleth	A. D. S. Gillett
Fairmont	John J. Skinner
Faribault	C. Willard Cross
Fergus Falls	R. L. Brown
Hastings	E. A. Durbahn
Hibbing	J. W. Richardson
International Falls	J. A. Sathrum
Little Falls	E. C. Van Dusen
Mankato	J. E. Anderson
Minneapolis	C. R. Reed
Moorhead	S. G. Reinertsen
New Ulm	Ernest M. Hanson
Owatonna	Irvin E. Rosa
Red Wing	G. V. Kinney
Rochester	G. H. Sanberg
St. Cloud	H. B. Gough
St. Paul	Paul S. Amidon
South St. Paul	Irvin T. Simley
Stillwater	Guy D. Smith
Virginia	L. A. Lavine
Willmar	A. M. Wisness
Winona	D. F. Dickerson

Mississippi

Biloxi	G. W. Ditto
Brookhaven	Edgar S. Bowlus
Clarksdale	H. B. Heidelberg
Columbus	C. N. Brandon
Corinth	Hal Anderson
Greenville	F. W. Murphy
Greenwood	W. C. Williams
Gulfport	B. Frank Brown
Hattiesburg	W. I. Thames
Jackson	J. G. Chastain
Laurel	R. H. Watkins
McComb	D. L. Blackwelder
Meridian	H. M. Ivy
Natchez	W. H. Braden
Tupelo	T. M. Milam
Vicksburg	H. V. Cooper
Yazoo City	R. J. Koonce

Missouri

Boonville	L. E. Ziegler
Brookfield	L. V. Crookshank
Cape Girardeau	L. G. Schultz
Carthage	J. L. Campbell
Chillicothe	H. R. McCall
Clayton	John L. Bracken
Clinton	Arthur Lee
Columbia	W. E. Rosenstengel
De Soto	O. T. Coil
Flat River	W. H. Lemmel
Fulton	J. T. Bush
Hannibal	E. T. Miller
Independence	E. B. Street
Jefferson City	William F. Knox
Joplin	E. A. Elliott
Kansas City	George Melcher
Kirksville	J. H. Neville
Kirkwood	F. P. Tillman
Maplewood	G. E. Dille
Marshall	W. M. Westbrook
Maryville	H. S. Thomas
Mexico	L. H. Hawthorne
Moberly	M. F. Beach
Nevada	Wade Fowler
Poplar Bluff	G. F. Loughead
Richmond	P. L. Collier
St. Charles	Stephen Blackhurst
St. Joseph	I. E. Stutsman
St. Louis	Henry J. Gerling
Sedalia	Heber U. Hunt
Sikeston	Roy V. Ellise
Springfield	Harry P. Study
Trenton	W. H. McDonald

City	Superintendent
University City	Charles Banks
Warrensburg	Edward Beatty
Washington	C. J. Burger
Webb City	D. R. McDonald
Webster Groves	W. E. Goslin
Wellston	Ernest F. Bush
Montana	
Anaconda	W. K. Dwyer
Billings	A. T. Peterson
Bozeman	D. S. Williams
Butte	Douglas Gold
Great Falls	Irving W. Smith
Havre	W. J. Shirley
Helena	Payne Templeton
Kalispell	W. D. Swetland
Lewistown	C. G. Manning
Livingston	B. A. Winans
Miles City	Glen G. Eye
Missoula	Ira B. Fee
Nebraska	
Alliance	H. G. Partridge
Beatrice	E. L. Novotny
Columbus	R. R. McGee
Fairbury	W. E. Scott
Falls City	A. B. Gelwick
Fremont	A. H. Waterhouse
Grand Island	C. Ray Gates
Hastings	A. H. Staley
Kearney	Harry A. Burke
Lincoln	M. C. Lefler
McCook	J. E. Shedd
Nebraska City	Marion R. Schrader
Norfolk	A. P. Burkhart
North Platte	W. J. Braham
Omaha	Homer W. Anderson
Scottsbluff	A. L. Burnham
York	Earle W. Wiltse
Nevada	
Las Vegas	Maude Frazier
Reno	E. Otis Vaughn
New Hampshire	
Berlin	Lloyd P. Young
Claremont	A. B. Kellogg
Concord	Chester A. Moody
Derry	George H. Whitcher
Dover	Chester L. Howe
Franklin	Fred S. Libbey
Keene	Laurence O. Thompson
Laconia	John S. Gilman
Lebanon	W. J. English
Manchester	L. P. Benezet
Nashua	Earle T. Tracey
Portsmouth	Harry L. Moore
Rochester	Arthur S. Rollins
Somersworth	H. L. Winslow
New Jersey	
Asbury Park	A. E. Kraybill
Atlantic City	Arthur Chenoweth
Audubon	William L. Fidler
Bayonne	Preston H. Smith
Belleville	W. R. Parmer
Bergenfield	Roy W. Brown
Bloomfield	Edgar S. Stover
Bogota	G. W. Leman
Boonton	M. Burr Mann
Bound Brook	Albert S. Davis
Bridgeton	Leigh M. Lott
Burlington	Vann H. Smith
Caldwell	D. C. Barnett
Camden	Leon N. Neulen
Carlstadt	Edward F. Krom
Carteret	Calvin F. Dengler
Cliffside Park	George F. Hall
Clifton	George J. Smith
Collingswood	John B. Ritter
Cranford	Howard R. Best
Dover	R. S. Bowlby
Dumont	Charles A. Selzer
Dunellen	Ralph W. Crane
East Orange	H. E. Kentopp, Acting
East Rutherford	Alfred S. Faust
Elizabeth	Ira T. Chapman
Englewood	Winton J. White
Fairview	Z. G. Masten, Jr.
Fort Lee	J. B. Thompson
Freehold	Lloyd S. Cassel
Garfield	Norman W. Cameron
Glen Ridge	H. W. Dutch
Gloucester	Charles T. Hassard
Guttenburg	Anna L. Klein
Hackensack	John A. Wilcox
Haddonfield	Everett C. Preston
Haddon Heights	William C. Davis
Hammonton	H. H. Smith
Harrison	John P. Murray
Hasbrouck Heights	C. C. Hitchcock
Hawthorne	F. H. Thoms
Highland Park	F. W. Furth
Hillside	A. G. Woodfield
Hoboken	Daniel S. Kealey
Irvington	Herschel S. Libby
Jersey City	James A. Nugent
Kearny	Edmund L. Tink
Leonia	Nelson C. Smith
Linden	Paul R. Brown
Lodi	Henry V. Matthews
Long Branch	William M. Smith
Lyndhurst	H. P. Shepherd
Madison	Harry A. Wann
Manville	Harold I. Merritt
Metuchen	Carl H. Galloway
Millville	Wylie G. Pate
Montclair	F. P. Reagle, Acting
Morristown	J. Burton Wiley
Neptune twp.	O. J. Moulton
Newark	Stanley Rolfe, Acting
New Brunswick	F. J. Sickles
Newton	C. H. Reagle
North Arlington	W. R. Nolbert
North Bergen	R. W. Madden
Nutley	John A. Spargo
Ocean City	George E. Brown
Orange	W. B. Patrick
Palisades Park	John W. Fuchs
Passaic	A. D. Arnold
Paterson	John R. Wilson
Paulsboro	Paul R. Carl
Pensauken twp.	George B. Fine
Perth Amboy	W. C. McGinniss
Phillipsburg	C. V. Sloan
Plainfield	F. W. Cook
Pleasantville	Simon M. Horstick
Princeton	B. Woodhull Davis
Prospect Park	Thomas L. Bump
Rahway	Arthur Perry
Red Bank	Edwin C. Gilland
Ridgefield	Charles Dixon
Ridgewood	I. B. Somerville
Roselle	John R. Patterson
Roselle Park	E. F. Smith
Rutherford	C. A. Fetterly
Salem	Halliday R. Jackson
Sayreville	Jesse Selner
Secaucus	M. J. Pechtel
Somerville	T. Latimer Brooks
South Amboy	Oscar O. Barr
South Orange	John H. Bosshart
South Plainfield	Harry C. Fries
South River	Lester A. Rodes
Summit	John B. Dougall
Teaneck	Lester N. Neulen
Tenafly	George A. Kipp
Trenton	Paul Loser
Union City	Arthur O. Smith
Union twp.	Edward F. Waldron
Verona	F. N. Brown
Vineland	Lawrence R. Winchell
Wallington	Joseph F. Moriarty
Weehawken	Kenneth F. Woodbury
Westfield	C. A. Philhower
West New York	H. L. Bain
West Orange	S. C. Strong
Wildwood	Henry C. Chalmers
Woodridge	N. Fremont Donley
New Mexico	
Albuquerque	John Milne
Clovis	J. M. Bickley
Gallup	Agnes Bartlett
Las Cruces	C. S. Conlee
Raton	E. E. Harrison
Roswell	J. D. Shinkle
Santa Fe	R. P. Sweeney
New York	
Albany	Austin R. Coulson
Amsterdam	Wilbur H. Lynch
Auburn	George F. Barford
Batavia	Clyde P. Wells
Beacon	E. D. Hewes
Binghamton	Daniel J. Kelly
Bronxville	Frederick H. Bair
Buffalo	Robt. T. Bapst
Canandaigua	Frank E. Fisk
Catskill	J. M. Schnitzer
Cohoes	William S. Schneider
Corning	William E. Severn (Dist. No. 9) Hugh W. Gregg (Dist. No. 13)
Cortland	John H. Burke, Acting
Depew	George R. Crego
Dobbs Ferry	J. A. McGinness
Dunkirk	F. R. Darling
East Rochester	Theodore L. R. Morgan
Elmira	H. O. Hutchinson
Elmira Heights	John W. Sahlstrom
Endicott	Herbert H. Crumb
Floral Park	Alvah T. Stanforth
Fredonia	Claude R. Dye
Freeport	John W. Dodd
Fulton	George R. Bodley
Garden City	Winfield A. Townsend
Geneva	W. L. Houseman
Glen Cove	H. H. Chapman
Glens Falls	A. W. Miller
Gloversville	H. W. Langworthy
Harrison	L. M. Klein
Hastings-on-Hudson	John L. Hopkins
Haverstraw	J. T. Kaemmerlen
Hempstead	William A. Gore
Herkimer	Loraine W. Bills
Hornell	Harrison S. Dodge
Hudson	M. C. Smith
Hudson Falls	David R. Finley
Huntington	Raymond C. Burdick
Ilion	Earl P. Watkin
Ithaca	C. L. Kulp
Jamestown	George A. Persell
Johnson City	H. B. Eccleston
Johnstown	E. L. Ackley
Kenmore	F. C. Densberger
Kingston	B. C. Van Ingen
Lackawanna	Clarence A. Conway
Lancaster	Frank L. Smith
Little Falls	Carlyle C. Ring
Lockport	R. B. Kelley
Long Beach	Walter J. Schwalje
Lynbrook	C. D. Vosburgh
Malone	Horace H. Lamberton
Mamaroneck	Arthur Z. Boothby
Massena	E. G. Simmons
Mechanicville	John N. Hayes
Medina	A. E. Trippensee
Middletown	E. H. Burdick
Mineola	Harlan B. Allen
Mount Kisco	H. M. Jennings
Mount Vernon	William H. Holmes
Newark	Edwin R. Woelfel
Newburgh	Marion W. Longman
New Rochelle	C. S. Bragdon
New York	Harold G. Campbell
Niagara Falls	James F. Taylor
North Tarrytown	Delbert O. Fuller
North Tonawanda	Claude L. Moss
Norwich	F. R. Wassung
Nyack	K. R. MacCalman
Ogdensburg	Arthur J. Laidlaw
Olean	W. C. Greenawalt
Oneida	Albert H. Covell
Oneonta	George J. Dann
Ossining	Harold V. Loomis
Oswego	Frederick Leighton
Oyster Bay	Leon Deming
Patchogue	Sheridan Linn
Peekskill	J. E. Scott
Penn Yan	C. G. Hetherington
Plattsburg	G. M. Elmendorf
Port Chester	Evan E. Jones
Port Jervis	A. H. Naylor
Poughkeepsie	Ward C. Moon
Rensselaer	Walter S. Clark
Rochester	James M. Spinning

City	Superintendent
Rockville Center	Floyd B. Watson
Rome	George R. Staley
Roslyn	F. R. Wegner
Rye	George E. Webster
Rye Neck	Donald M. Tower
Salamanca	George A. Place
Saranac Lake	H. V. Littell
Saratoga Springs	Harris Crandall
Scarsdale	Vernon G. Smith
Schenectady	W. H. Pillsbury
Scotia	B. W. Conrad
Seneca Falls	Hubert Mott
Solvay	Claude A. Duvall
Syracuse	G. Carl Alverson
Tarrytown	J. Leroy Thompson
Tonawanda	Earle F. Wingate
Troy	Neil K. White (Lansingburg Dist.) George H. Krug (Union District)
Tuckahoe	John C. Goff (Dist. No. 1) Frank M. Buckley (Dist. No. 2)
Tupper Lake	R. E. Minnich
Utica	John A. De Camp
Valley Stream	Harry W. Gross
Watertown	C. E. Sabin
Watervliet	William Richmond
Waverly	P. C. Meserve
Wellsville	George F. Jammer
Whitehall	Page E. Cole
White Plains	H. Claude Hardy
Yonkers	

North Carolina

Asheboro	Reginald Turner
Asheville	R. H. Latham
Burlington	L. E. Spikes
Canton	A. J. Hutchins
Charlotte	H. P. Harding
Concord	A. S. Webb
Durham	W. F. Warren
Elizabeth City	E. E. Bundy
Fayetteville	Horace Sisk
Gastonia	W. P. Grier
Goldsboro	Ray Armstrong
Greensboro	B. L. Smith
Greenville	J. H. Rose
Henderson	E. M. Rollins
Hendersonville	F. M. Waters
Hickory	R. W. Carver
High Point	T. Wingate Andrews
Kings Mountain	B. N. Barnes
Kinston	W. A. Graham
Lenoir	C. S. Warren
Lexington	A. W. Honeycutt
Monroe	W. R. Kirkman
Mooresville	H. C. Miller
Morganton	W. F. Starnes
Mount Airy	L. B. Pendergraph
New Bern	H. B. Smith
Raleigh	Claude F. Gaddy
Reidsville	L. J. Perry
Rocky Mount	R. M. Wilson
Salisbury	J. H. Knox
Shelby	W. E. Abernathy
Statesville	R. M. Gray
Tarboro	W. A. Mahler
Thomasville	J. N. Hauss
Washington	E. S. Johnson
Wilmington	H. M. Roland
Wilson	K. R. Curtis
Winston-Salem	J. W. Moore

North Dakota

Bismarck	H. O. Saxvik
Devils Lake	F. H. Gilliland
Dickinson	P. S. Berg
Fargo	H. H. Kirk
Grand Forks	Elroy Schroeder
Jamestown	C. L. Robertson
Mandan	J. C. Gould
Minot	L. A. White
Valley City	G. W. Hanna
Williston	J. N. Urness

Ohio

Akron	Ralph H. Waterhouse
Alliance	B. F. Stanton
Ashland	J. E. Bohn
Ashtabula	M. S. Mitchell
Athens	Harper C. Pendry
Barberton	U. L. Light
Bedford	A. E. Moody
Bellaire	J. V. Nelson
Bellefontaine	S. A. Frampton
Bellevue	D. H. Patton
Berea	J. F. Koeppe
Bexley	H. C. Dieterich
Bowling Green	Arch B. Conklin
Bucyrus	D. C. Baer
Cambridge	Hugh R. Hick
Campbell	Andrew S. Klinko
Canton	Jesse H. Mason
Chillicothe	M. M. Berry
Cincinnati	Edward D. Roberts
Circleville	Frank Fischer
Cleveland	Charles H. Lake
Cleveland Heights	Frank L. Wiley
Columbus	J. G. Collicott
Conneaut	C. M. Dickey
Coshocton	A. C. Pence
Cuyahoga Falls	Gilbert Roberts
Dayton	C. V. Courter
Defiance	B. M. Lindemuth
Delaware	D. R. Smith
Delphos	E. W. Bell
Dover	C. E. Palmer
East Cleveland	W. H. Kirk
East Liverpool	Herbert G. Means
East Palestine	T. R. Hersh
Elyria	R. C. Maston
Euclid	E. C. Grover
Findlay	F. L. Kinley
Fostoria	J. M. Reed
Fremont	H. H. Church
Galion	O. E. Hill
Gallipolis	E. E. Higgins
Garfield Heights	Harold R. Maurer
Girard	E. O. Trescott
Grandview Heights (Columbus P. O.)	W. C. Rohleder
Greenville	C. L. Bailey
Hamilton	D. R. Baker
Ironton	John A. Miller
Jackson	T. K. Owens
Kent	W. A. Walls
Kenton	L. E. McKinley
Lakewood	Geo. A. Bowman
Lancaster	C. L. Berry
Lima	R. E. Offenhauer
Lockland	J. U. Dungan
Logan	G. E. Carr
Lorain	P. C. Bunn
Mansfield	W. L. Miller
Maple Heights (Bedford P. O.)	M. C. Helm
Marietta	H. L. Sullivan
Marion	C. A. Hudson
Martins Ferry	W. L. Kocher
Massillon	L. J. Smith
Miamisburg	Harris V. Bear
Middletown	R. W. Solomon
Mingo Junction	Claude A. Bruner
Mount Vernon	A. W. Elliott
Nelsonville	E. J. Arnold
Newark	Paul B. Edwards
New Boston	D. E. Ross
New Philadelphia	H. S. Carroll
Niles	S. J. Bonham
Norwalk	H. C. Ellis
Norwood	Harold S. Bates
Oakwood (Dayton P. O.)	A. E. Claggett
Painesville	C. C. Pierce
Parma	F. S. Shields
Piqua	G. C. Dietrich
Portsmouth	Frank Appel
Ravenna	C. R. Dustin
Reading	H. L. Bussey
Rocky River	J. J. Young
St. Bernard	C. W. Williams
St. Marys	C. C. McBroom
Salem	E. S. Kerr
Sandusky	F. J. Prout
Shaker Heights	Arthur K. Loomis
Shelby	R. I. Lewis
Sidney	C. C. Crawford
Springfield	Homer L. Stevens
Steubenville	Russell H. Erwine
Struthers	H. E. Zuber
Tiffin	Paul V. Brown
Toledo	Ralph E. Dugdale
Toronto	S. C. Dennis
Troy	T. E. Hook
Uhrichsville	H. B. Galbraith
Urbana	C. W. Cookson
Van Wert	U. E. Diener
Wadsworth	Frank H. Close
Wapakoneta	M. R. Menschel
Warren	H. B. Turner
Washington Court House	L. W. Reese
Wellston	H. L. Holter
Wellsville	S. E. Daw
Wilmington	H. W. Hodson
Wooster	C. M. Layton
Xenia	R. J. Warner
Youngstown	Geo. E. Roudebush
Zanesville	C. T. Prose

Oklahoma

Ada	B. R. Stubbs
Altus	A. G. Steele
Alva	C. A. Parker
Anadarko	R. L. McLean
Ardmore	O. E. Shaw
Bartlesville	H. E. Wrinkle
Blackwell	Harry Hutson
Bristow	E. H. Black
Chickasha	T. T. Montgomery
Clinton	George D. Hann
Cushing	W. B. French
Duncan	N. L. George
Durant	G. T. Stubbs
Elk City	A. M. Keeth
El Reno	Paul R. Taylor
Enid	DeWitt Waller
Guthrie	W. A. Greene
Henryetta	E. E. Battles
Holdenville	Wade H. Shumate
Hugo	Harvey M. Black
Lawton	B. C. Swinney
McAlester	M. J. Hale
Miami	R. C. Nichols
Muskogee	J. R. Holmes
Norman	J. B. Stout
Oklahoma City	C. K. Reiff
Okmulgee	W. Max Chambers
Pawhuska	Harry E. Moore
Picher	L. R. Pfost
Ponca City	C. P. Howell
Sand Springs	Clyde H. Odell
Sapulpa	E. O. Shaw
Seminole	John G. Mitchell
Shawnee	A. L. Burks
Stillwater	E. D. Price
Tulsa	H. W. Gowans
Wewoka	Harry D. Simmons
Woodward	Joe T. Williamson

Oregon

Albany	Rex Putnam
Astoria	A. C. Hampton
Baker	Hugh Coleman
Bend	R. E. McCormack
Corvallis	H. W. Adams
Eugene	H. R. Goold
Klamath Falls	J. P. Wells
La Grande	A. L. Gralapp
Marshfield	Lynn A. Parr
Medford	E. H. Hedrick
Oregon City	J. T. Longfellow
Pendleton	Austin Landreth
Portland	Charles A. Rice
Salem	Silas Gaiser
The Dalles	J. F. Cramer

Pennsylvania

Abington	Joseph C. Wierick
Aliquippa	H. R. Vanderslice
Allentown	
Altoona	Robert E. Laramy
Ambridge	J. R. Miller
Archbald	John F. Moran
Arnold	H. L. Holste
Ashland	Edward W. Taylor

City	*Superintendent*
Ashley	Robert C. Metz
Bangor	O. W. Ackerman
Beaver	G. A. McCormick
Beaver Falls	J. Roy Jackson
Bellevue	Harry E. Brumbaugh
Bensalem twp. (Address Cornwall Heights)	Samuel K. Faust
Berwick	M. E. Houck
Bethlehem	W. H. Weiss
Blakely Boro. (Address Peckville)	H. B. Anthony
Braddock	T. G. McCleary
Bradford	Floyd C. Fretz
Bridgeport	C. C. Smith
Butler	John A. Gibson
Canonsburg	F. W. McVay
Carbondale	Mary B. McAndrew
Carlisle	J. W. Potter
Carnegie	Norman L. Glasser
Cecil twp. (Address Canonsburg)	H. S. Kuder
Chambersburg	U. L. Gordy
Charleroi	T. L. Pollock
Cheltenham twp. (Address Elkins Park)	Frank C. Ketler
Chester	F. Herman Fritz
Clairton	H. D. Teal
Clearfield	S. F. W. Morrison
Coal twp. (Address Shamokin)	P. F. Brennan
Coatesville	Carl O. Benner
Collingdale	F. E. Stengle
Columbia	J. B. Kennedy
Connellsville	Bela B. Smith
Conshohocken	Robert C. Landis
Corry	Ralph S. Dewey
Crafton	E. O. Liggitt
Darby	W. R. Douthett
Derry twp. (Address Hershey)	J. I. Baugher
Dickson City	P. M. Brennan
Donora	John E. Shambach
Dormont	David H. Stewart
Du Bois	R. W. Robinson
Dunbar twp. (Address Leisenring)	R. K. Smith
Dunmore	J. R. Gilligan
Duquesne	C. H. Wolford
Easton	James C. Bay
East Pittsburgh	Charles F. Young
Ellwood City	Vaughn R. DeLong
Emaus	H. J. Yeager
Erie	C. Herman Grose
Etna	H. G. Norris
Exeter	John B. Campbell
Farrell	W. W. Irwin
Fell twp. (Address Carbondale)	John H. Campbell
Ford City	Quincey G. Vincent
Forest City	Jules J. Kerl
Franklin	Karl M. Russell
Gettysburg	L. C. Keefauver
Greensburg	Wm. H. McIlhattan
Greenville	R. D. Welch
Grove City	H. M. B. Lehn
Hanover	C. V. Erdly
Harrisburg	R. R. Abernethy
Haverford twp. (Address Upper Darby)	J. Frank Carter
Hazle twp. (Address Hazleton)	M. W. Garrette
Hazleton	A. D. Thomas
Holidaysburg	Hobson C. Wagner
Homestead	Port Eckles
Honesdale	J. H. Koehler
Huntington	J. G. Everard
Indiana	Norman C. Koontz
Jeanette	E. W. Long
Johnstown	Dale D. McMaster
Kane	Glennis H. Rickert
Kingston	J. R. Merkel
Kittanning	Clyde W. Cranmer
Lancaster	H. E. Gress
Lansdale	Ralph R. Smith
Lansdowne	S. N. Ewan, Jr.
Lansford	E. M. Balsbaugh
Latrobe	John G. Hulton
Lebanon	John W. Hedge
Lehighton	Bert B. David
Lewistown	D. M. Albright
Lock Haven	J. F. Puderbaugh
Lower Merion twp. (Address Ardmore)	S. Edgar Downs
Mahanoy City	Joseph F. Noonan
Mahanoy twp. (Address Mahanoy City)	Joseph F. Noonan
Mauch Chunk twp. (Address Nesquehoning)	Clayton W. Wotring
McKeesport	James H. Lawson
McKees Rocks	W. H. Church
Meadville	Warren P. Norton
Mechanicsburg	R. L. Van Scoten
Middletown	G. W. Feaser
Midland	W. S. Bazard
Milton	Carl L. Millward
Minersville	C. E. Roudabush
Monessen	Wade F. Blackburn
Monongahela	John H. Dorr
Mount Carmel	G. A. Beierschmitt
Mt. Carmel twp. (Address Locust Gap)	P. J. Burke
Mount Lebanon	H. V. Herlinger
Mount Oliver	Minnie Ubinger
Mount Pleasant	J. C. Haberlen
Mount Pleasant twp. (Address Mt. Pleasant)	Lloyd F. Rumbaugh
Muhlenberg twp. (Address Temple)	C. E. Cole
Munhall	Charles R. Stone
Nanticoke	A. P. Diffendafer
Nanty-Glo	C. H. Bowers
New Brighton	S. W. Lyons
New Castle	Clyde C. Green
New Kensington	E. T. Chapman
Newport twp. (Address Glen Lyon)	H. U. Nyhart
Norristown	H. O. Dietrich
Northampton	G. A. Eichler
North Braddock	F. D. Zuerner
Oakmont	W. Lee Gilmore
Oil City	R. A. Baum
Old Forge	B. T. Harris
Olyphant	John A. Dempsey
Palmerton	J. N. Roeder
Philadelphia	Edwin C. Broome
Phoenixville	Martin L. Peters
Pittsburgh	Ben G. Graham
Pittston	D. J. Cray
Plymouth	H. S. Jones
Pottstown	Frank Haiston
Pottsville	L. A. BuDahn
Punxsutawney	F. S. Jackson
Radnor twp. (Address Wayne)	Sydney V. Rowland
Rankin	Frank J. Good
Reading	Thomas Henry Ford
Ridgway	A. C. Nelson
Rochester	Robert P. Barner
Rostraver twp. (Address Belle Vernon)	W. H. Cober
St. Clair	Charles R. Birch
Sayre	Horace H. Beach
Scottdale	S. B. Bulick
Scranton	John H. Dyer
Shamokin	P. E. Whitmeyer
Sharon	W. D. Gamble
Shenandoah	A. J. Ratchford
Springfield twp. (Address Chestnut Hill)	A. L. Gehman
Steelton	Orris H. Aurand
Summit Hill	E. T. McCready
Sunbury	C. C. Maderia
Swissvale	C. S. Baily
Tamaqua	F. G. Horner
Tarentum	A. D. Endsley
Taylor	W. J. Powell
Throop	John J. O'Hara
Titusville	G. A. Stetson
Tredyffrin twp. (Address Berwyn)	Wilmer K. Groff
Tyrone	W. W. Eisenhart
Uniontown	J. N. Mowls
Upper Darby	William C. Sampson
Upper Merion twp. (Address Wayne, R. D.)	Lloyd A. Moll
Vandergrift	John R. Kurtz
Warren	J. G. Rossman
Washington	Meyers B. Horner
Waynesboro	D. J. Keener
West Chester	Walter L. Philips
West Mahanoy twp. (Address Shenandoah)	Henry F. Murray
West Pittston	R. J. W. Templin
West View	R. E. McKee
West York	A. H. Martin
Whitehall twp. (Address Hokendauqua)	William D. Landis
Wilkes-Barre	A. E. Bacon
Wilkinsburg	W. C. Graham
Williamsport	A. M. Weaver
Wilson Boro. (Address Easton)	C. E. Furst
Windber	Joseph L. Hackenberg
Winton Boro. (Address Jessup)	J. L. McCloskey
Yeadon	Charles E. Hershey
York	A. W. Ferguson

Rhode Island

Barrington	Charles H. Keyes
Bristol	E. S. Mapes
Burrillville	J. C. Sweeney
Central Falls	James E. Martin
Coventry	R. E. E. Campbell
Cranston	C. W. Bosworth
Cumberland	Bernard F. Norton
East Providence	J. R. D. Oldham
Johnston	Albert A. Thornton
Lincoln	John L. Smith
Newport	Harold T. Lowe
North Providence	James L. McGuire
Pawtucket	Frank A. R. Allen
Providence	A. J. Stoddard
South Kingstown	E. K. Wilcox
Warren	Leroy G. Staples
Warwick	Warren A. Sherman
Westerly	Willard H. Bacon
West Warwick	John F. Deering
Woonsocket	Leon M. Farrin

South Carolina

Aiken	L. K. Hagood
Anderson	E. C. McCants
Camden	J. G. Richards, Jr.
Charleston	A. B. Rhett
Chester	Myron E. Brockman
Clinton	W. E. Monts
Columbia	A. C. Flora
Darlington	J. C. Daniel
Florence	John W. Moore
Gaffney	L. F. Carson
Georgetown	W. C. Bynum
Greenville	J. L. Mann
Greenwood	W. E. Black
Hartsville	J. H. Thornwell
Laurens	C. K. Wright
Newberry	O. B. Cannon
Orangeburg	A. J. Thackson
Rock Hill	R. C. Burts
Spartanburg	L. W. Jenkins
Sumter	W. F. Loggins
Union	T. C. Jolly, Jr.

South Dakota

Aberdeen	C. L. Dalthorp
Huron	Andrew J. Lang
Lead	R. V. Hunkins
Mitchell	John C. Lindsey
Rapid City	E. B. Bergquist
Sioux Falls	A. A. MacDonald

City	Superintendent
Watertown	H. Mackenzie
Yankton	C. A. Beaver
Tennessee	
Alcoa	V. F. Goddard
Athens	J. C. Ridenour
Bristol	J. H. Arrants
Chattanooga	W. T. Robinson
Clarksville	C. H. Moore
Cleveland	R. T. Allen
Columbia	R. L. Harris
Dyersburg	C. M. Walker
Elizabethton	E. L. Bowers
Greenville	Mac Alexander
Jackson	C. B. Ijams
Johnson City	Roy G. Biglow
Kingsport	R. N. Robinson
Knoxville	Harry Clark
Memphis	Ernest Ball
Morristown	Carl T. Vance
Murfreesboro	J. C. Mitchell
Nashville	H. F. Srygley
Paris	W. O. Inman
Shelbyville	Troy G. Young
Springfield	Wilbur S. Young
Union City	J. T. Webb
Texas	
Abilene	R. D. Green
Amarillo	C. M. Rogers
Austin	A. N. McCallum
Beaumont	M. E. Moore
Big Spring	W. C. Blankenship
Bonham	H. A. Glass
Borger	W. A. McIntosh
Breckenridge	N. S. Holland
Brenham	M. B. Holleman
Brownsville	E. C. Dodd
Brownwood	E. J. Woodward
Bryan	S. M. Brown
Childress	A. W. Adams
Cisco	R. N. Cluck
Cleburne	Emmett Brown
Coleman	C. H. Hufford
Corpus Christi	E. H. Hereford
Corsicana	W. H. Norwood
Dallas	N. R. Crozier
Del Rio	R. M. Bankhead
Denison	F. B. Hughes
Denton	R. C. Patterson
Eagle Pass	F. R. Thompson
Electra	B. M. Dinsmore
El Paso	A. H. Hughey
Ennis	Newton W. McCann
Fort Worth	W. M. Green
Gainesville	H. O. McCain
Galveston	S. F. Graham
Goose Creek	Harmon Lowman
Greenville	J. L. Bergin
Harlingen	E. C. Deering
Highland Park	H. E. Gable
Hillsboro	Loy W. Hartsfield
Houston	E. E. Oberholtzer
Huntsville	C. N. Shaver
Jacksonville	Larue Cox
Kingsville	C. E. Wade
Laredo	W. P. Galligan
Longview	Henry L. Foster
Lubbock	K. E. Oberholtzer
Lufkin	I. A. Coston
Luling	R. A. Box
Marlin	H. J. McIlhany
Marshall	J. P. Buck
McAllen	John H. Gregory
McKinney	Jack R. Ryan
Mercedes	Ernest H. Poteet
Mexia	Frank L. Williams
Midland	W. W. Lackey
Mineral Wells	H. H. Hutto
Mission	H. C. Proctor
Nacogdoches	Rufus E. Price
Navasota	J. T. Ferguson
New Braunfels	E. A. Sahm
Orange	W. E. Lowry
Palestine	Bonner Frizzell
Pampa	R. B. Fisher
Paris	A. H. Chamness
Plainview	C. E. Davis
Port Arthur	G. M. Sims
Ranger	W. T. Walton
San Angelo	Felix E. Smith
San Antonio	J. C. Cochran
San Benito	O. L. Davis
San Marcos	L. J. Berry
Seguin	Joe F. Saegert
Sherman	L. T. Cook
Sulphur Springs	W. L. Willis
Sweetwater	R. S. Covey
Taylor	E. T. Robbins
Temple	L. C. Procter
Terrell	J. E. Langwith
Texarkana	H. W. Stilwell
Tyler	J. M. Hodges
Uvalde	Guy D. Dean
Vernon	W. T. Lofland
Victoria	P. S. Garner
Waco	R. H. Brister
Waxahachie	G. B. Winn
Wichita Falls	H. D. Fillers
Yoakum	G. P. Barron
Utah	
Brigham	Hervin Bunderson (a)
Logan	E. Allen Bateman
Murray	James Clove
Ogden	W. Karl Hopkins
Provo	H. A. Dixon
Salt Lake City	L. John Nuttall, Jr.
Tooele	P. M. Nielsen (a)
Vermont	
Barre	Wm. H. Carter
Bennington	H. D. Sylvester
Brattleboro	Florence M. Wellman
Burlington	Lyman C. Hunt
Montpelier	W. A. Kincaid
Newport	E. A. Hamilton
Rockingham	Natt B. Burbank
Rutland	W. W. Fairchild
St. Albans	Josiah S. McCann
St. Johnsbury	Frank R. Adams
Winooski	G. R. Stackpole
Virginia	
Alexandria	T. C. Williams
Bristol	Roy B. Bowers
Charlottesville	James G. Johnson
Clifton Forge	Herman Blankinship
Covington	S. T. Godbey (d)
Danville	G. L. H. Johnson
Fredericksburg	G. H. Brown
Hampton	Robert M. Newton
Harrisonburg	W. H. Keister
Hopewell	R. W. Copeland
Lynchburg	Omer Carmichael
Martinsville	E. E. Givens (d)
Newport News	J. H. Saunders
Norfolk	C. W. Mason
Petersburg	Henry G. Ellis
Portsmouth	Harry A. Hunt
Pulaski	H. H. Bruce (d)
Radford	W. K. Barnett
Richmond	J. H. Binford
Roanoke	D. E. McQuilkin
South Norfolk	R. H. Pride
Staunton	L. F. Shelburne
Suffolk	John E. Martin
Winchester	G. R. Quarles
Waynesboro	R. C. Jennings
Washington	
Aberdeen	C. J. Powell
Anacortes	De Fore Cramblitt
Bellingham	C. Paine Shangle
Bremerton	Tillman Peterson
Centralia	Paul F. Ferguson
Everett	R. E. Cook
Hoquiam	H. C. Crumpacker
Kelso	C. H. Lillie
Longview	E. J. McNamara
Olympia	L. P. Brown
Port Angeles	F. W. Breakey
Puyallup	P. B. Hanawalt
Seattle	Worth McClure
Spokane	O. C. Pratt
Tacoma	Elmer L. Breckner
Vancouver	Paul Gaiser
Walla Walla	W. A. Lacey
Wenatchee	John W. Goddard
Yakima	A. C. Davis
West Virginia	
Beckley	B. B. Chambers (a)
Bluefield	C. H. Archer (a) (Address Princeton)
Charleston	Fred L. Teal (a)
Clarksburg	J. A. Jackson (a)
Elkins	Bryan Hamilton (a)
Fairmont	J. J. Straight (a)
Grafton	E. G. Kuhn (a)
Hinton	Margaret Nicely (a)
Huntington	R. B. Marston (a)
Keyser	Paul C. Rouzer (a)
Martinsburg	G. Wm. Ropp (a)
Morgantown	Floyd B. Cox (a)
Moundsville	Louis R. Potts (a)
Parkersburg	John A. Davis, Jr. (a)
Princeton	C. H. Archer (a)
Richwood	L. O. Bobbitt (a)
South Charleston	Fred L. Teal (a) (Address Charleston)
Welch	George W. Bryson (a)
Wellsburg	Olen Rutan (a)
Weston	W. W. Lovell (a)
Wheeling	J. P. McHenry (a)
Williamson	C. O. Batson (a)
Wisconsin	
Antigo	P. A. Tipler
Appleton	Ben J. Rohan
Ashland	George A. Bassford
Baraboo	A. C. Kingsford
Beaver Dam	A. H. Luedke
Beloit	D. F. R. Rice
Chippewa Falls	Robert F. Lohrie
Cudahy	J. R. Brandsmark
De Pere	T. J. McGlynn
Eau Claire	Alvin T. Stolen
Fond du Lac	L. P. Goodrich
Fort Atkinson	Frank C. Bray
Green Bay	G. E. Denman
Janesville	V. E. Klontz
Kaukauna	J. F. Cavanaugh
Kenosha	G. F. Loomis
La Crosse	G. M. Wiley
Madison	R. W. Bardwell
Manitowoc	Hugh S. Bonar
Marinette	G. E. Watson
Marshfield	R. F. Lewis
Menasha	F. B. Younger
Menomonie	W. G. Ballentine
Merrill	George F. Brooks
Milwaukee	M. C. Potter
Monroe	E. O. Evans
Neenah	C. F. Hedges
Oconto	L. W. Fulton
Oshkosh	Charles C. Bishop
Portage	A. J. Henkel
Racine	Wm. C. Giese
Rhinelander	W. F. Kruschke
Rice Lake	W. F. Waterpool
Sheboygan	H. E. Smith
Shorewood	H. S. Hemenway
South Milwaukee	John P. Mann
Stevens Point	P. M. Vincent
Superior	W. R. Davies
Two Rivers	Fred G. Bishop
Watertown	R. A. Buell
Waukesha	G. O. Banting
Waupun	H. C. Wegner
Wausau	E. C. Hirsch
Wauwatosa	W. T. Darling
West Allis	H. B. Nash
Whitefish Bay	C. L. Mulrine
Wisconsin Rapids	A. R. Page
Wyoming	
Casper	Dean Morgan
Cheyenne	A. S. Jessup
Laramie	A. A. Slade
Rock Springs	E. M. Thompson
Sheridan	J. J. Early

References

(a) County superintendent. (b) Parish superintendent.

SECTION XV
SUPERINTENDENTS OF CATHOLIC PAROCHIAL SCHOOLS

Archdioceses

BALTIMORE, MD.—Rev. John I. Barrett, Diocesan Superintendent of Schools, The Bureau of Catholic Education, 415 Cathedral Street.

BOSTON, MASS.—Rev. Richard J. Quinlan, Diocesan Supervisor of Schools, 75 Union Park Street.

CHICAGO, ILL.—Rev. D. F. Cunningham, Diocesan Superintendent of Schools, 755 N. State Street.

CINCINNATI, OHIO.—Rev. Carl J. Ryan, Superintendent of Parochial Schools, 28 Calhoun Street.

DUBUQUE, IOWA.—Rt. Rev. Msgr. John M. Wolfe, Diocesan Superintendent of Schools, Corner Eleventh and Bluff Streets.

MILWAUKEE, WIS.—Diocesan Superintendent of Schools, 2000 West Wisconsin Avenue.

NEW ORLEANS, LA.—Rev. Edward C. J. Prendergast, Archdiocesan Superintendent of Catholic Schools, 7845 Apricot Street.

NEW YORK, N. Y.—Rev. William R. Kelly, Diocesan Superintendent of Schools, 23 East Fifty-first Street.

PHILADELPHIA, PA.—Rt. Rev. Msgr. John J. Bonner, Superintendent of Parochial Schools, 19th and Wood Streets.

PORTLAND, ORE.—Rev. Warren A. Waitt, Diocesan Superintendent of Schools, 806 N. E. Alberta Street.

ST. LOUIS, MO.—Rev. James P. Murray, Superintendent of Parish Schools, 2336 University Street.

ST. PAUL, MINN.—Rev. James A. Byrnes, Diocesan Superintendent of Schools, 240 Summit Avenue.

SAN ANTONIO, TEXAS.—President of the School Board, Chancery Office, 230 Dwyer Avenue.

SAN FRANCISCO, CALIF.—Rev. James H. Long, Diocesan Superintendent of Schools, 50 Oak Street.

Dioceses

ALBANY, N. Y.—Rev. James P. Hanrahan, Superintendent of Parish Schools, 51 State Street.

ALTOONA, PA.—Rev. Francis McNelis, Diocesan Superintendent of Schools, 511 Twentieth Street.

BAKER CITY, ORE.—Rev. John D. Lee, Diocesan Superintendent of Schools.

BELLEVILLE, ILL.—Rev. John J. Fallon, Diocesan Superintendent of Schools, 6300 West Main Street.

BOISE, IDAHO.—Rev. J. P. O'Toole, Diocesan Superintendent of Schools, 412 State Street.

BROOKLYN, N. Y.—Rt. Rev. Msgr. Joseph V. S. McClancy, Diocesan Superintendent of Schools, 75 Greene Avenue.

BUFFALO, N. Y.—Rev. John W. Peel, Superintendent of Parochial Schools, 793 Elk Street.

BURLINGTON, VT.—Very Rev. W. P. Crosby, President of the School Board, 7 Fullerton Avenue, Montpelier, Vt.

CHARLESTON, S. C.—Rev. Joseph L. O'Brien, Diocesan Superintendent of Schools, 136 St. Philips Street.

CLEVELAND, OHIO.—Rt. Rev. Msgr. John R. Hagan, Diocesan Superintendent of Schools, 605 Guarantee Title Building.

COLUMBUS, OHIO.—Rt. Rev. Msgr. John J. Murphy, Diocesan Superintendent of Schools, 1651 East Main Street.

CONCORDIA, KANS.—Rt. Rev. Msgr. A. J. Luckey, President of the School Board, Manhattan, Kans.

CORPUS CHRISTI, TEXAS.—Rt. Rev. Msgr. J. J. Lannon, Diocesan Superintendent of Schools, St. Patrick's Cathedral.

COVINGTON, KY.—Rev. Alfred Hansen, Diocesan Superintendent of Schools, Holy Family School, Ashland, Ky.

CROOKSTON, MINN.—Rev. Victor Miller, Diocesan Superintendent of Schools, St. Joseph's Church, Ada, Minn.

DALLAS, TEXAS.—Rev. Thomas S. Zachry, Diocesan Superintendent of Schools, 2215 Ross Avenue.

DAVENPORT, IOWA.—Rev. P. J. O'Reilly, Diocesan Superintendent of Schools, St. Patrick's Rectory, Iowa City, Iowa.

DENVER, COLO.—Diocesan School Office, 230 East Seventeenth Avenue.

DES MOINES, IOWA.—Rev. L. V. Lyons, Diocesan Superintendent of Schools, St. Ambrose Cathedral.

DETROIT, MICH.—Rev. Carroll F. Deady, Diocesan Superintendent of Schools, 1234 Washington Boulevard.

DULUTH, MINN.—Rev. John Sholar, Diocesan Superintendent of Schools, 317 North Second Avenue W.

ERIE, PA.—Rev. Joseph J. Wehrle, Superintendent of Catholic Schools, 225 West Ninth Street.

FALL RIVER, MASS.—Rev. Edward J. Gorman, Superintendent of Diocesan Schools, 162 Walnut Street.

FARGO, N. DAK.—Rt. Rev. Msgr. John Baker, Diocesan Superintendent of Schools, Valley City, N. Dak.

FORT WAYNE, IND.—Rev. Thomas E. Dillon, Diocesan Superintendent of Schools, 903 North Jefferson Street, Huntington, Ind.

GALVESTON, TEXAS.—Rt. Rev. Jacob Schnetzer, Diocesan Superintendent of Schools, 4015 Sherman Avenue, Houston, Tex.

GRAND ISLAND, NEBR.—Rev. Bernard Galvin, Diocesan Superintendent of Schools, St. Michael's Church, Spalding, Nebr.

GREAT FALLS, MONT.—Rev. J. A. Rooney, Diocesan Superintendent of Schools, 1306 North Main Street, Walkerville, Mont.

GREEN BAY, WIS.—Rev. E. J. Westenberger, Superintendent of Catholic Schools, 128 South Monroe Avenue.

HARRISBURG, PA.—Rev. Harold E. Keller, Diocesan Superintendent of Parish Schools, Catholic High School, Twenty-third and Market Streets.

HARTFORD, CONN.—Rev. Austin Munich, Diocesan Supervisor of Schools, St. Thomas Seminary, Bloomfield, Conn.

HELENA, MONT.—Rev. J. A. Rooney, Diocesan Superintendent of Schools, 1306 North Main Street, Walkerville, Mont.

INDIANAPOLIS, IND.—Rev. Leonard Wernsing, Diocesan Superintendent of Schools, 128 West Georgia Street.

KANSAS CITY, MO.—Rev. V. A. Schroeger, Superintendent of Schools, 309 Benton Boulevard.

LA CROSSE, WIS.—Rev. Lester W. Seemann, Diocesan Superintendent of Schools, Twenty-fourth and Cass Streets.

LAFAYETTE, LA.—Very Rev. Anthony F. Canon Isenberg, Diocesan Superintendent of Schools, The Cathedral.

LEAVENWORTH, KANS.—Rt. Rev. Msgr. J. P. McInerney, President of the School Board, 204 West Eighth Street, Topeka, Kans.

LINCOLN, NEBR.—Rev. L. V. Barnes, Diocesan Superintendent of Schools, 1410 Sharp Building.

LITTLE ROCK, ARK.—Rt. Rev. Msgr. John J. Healy, Diocesan Superintendent of Schools, Little Rock College.

LOS ANGELES, CALIF.—

LOUISVILLE, KY.—Rev. Felix N. Pitt, Diocesan Superintendent of Schools, 443 South Fifth Street.

MANCHESTER, N. H.—Rev. William P. Clancy, Diocesan Superintendent of Schools, Mount St. Mary's Academy, Hooksett, N. H.

MARQUETTE, MICH.—Rev. Mathias H. La Violette, Superintendent of Parochial Schools, 202 West Case Street, Negaunee, Mich.

MOBILE, ALA.—Rev. L. J. Carroll, Superintendent of Parochial Schools, Bishop Toolen High School, 400 Government Street.

MONTEREY and FRESNO, CALIF.—Rev. James Dowling, Diocesan Superintendent of Schools, Fresno.

NASHVILLE, TENN.—Rev. George J. Flanigan, Diocesan Superintendent of Schools, 2300 Elliston Place.

NEWARK, N. J.—Very Rev. Msgr. William F. Lawlor, Diocesan Superintendent of Schools, 33 Mulberry Street.

OGDENSBURG, N. Y.—Rev. John M. Hogan, Diocesan Superintendent of Schools, Wadhams Hall.

OKLAHOMA CITY and TULSA, OKLA.—Bishop's Secretary, Chancery Office, 1000 North Lee Avenue, Oklahoma City.

OMAHA, NEBR.—Rev. Joseph H. Ostdiek, Diocesan Superintendent of Schools, 2507 Cass Street.

PEORIA, ILL.—Rev. M. J. Haddigan, Diocesan Superintendent of Schools, 607 North Madison Avenue.

PITTSBURGH, PA.—Rev. Paul E. Campbell, Diocesan Superintendent of Schools, 5325 Penn Avenue.

PORTLAND, MAINE.—Rev. John J. Barrett, Diocesan Superintendent of Schools, Hebron, Maine.

PROVIDENCE, R. I.—Rev. Thomas V. Cassidy, Diocesan Superintendent of Parochial Schools, 20 Regent Avenue.

RAPID CITY, MICH.—Most Rev. John J. Lawler, President of the School Board, 1622 West Boulevard.

RICHMOND, VA.—Rev. Francis J. Byrne, Diocesan Superintendent of Schools, 811 Cathedral Place.

ROCHESTER, N. Y.—Rev. John M. Duffy, Diocesan Superintendent of Schools, 50 Chestnut Street.

ROCKFORD, ILL.—Rev. William J. Donovan, Diocesan Superintendent of Schools, 95 East Wilson Street, Batavia, Ill.

SACRAMENTO, CALIF.—Diocesan Superintendent of Schools, 1017 Eleventh Street.

ST. CLOUD, MINN.—Rev. T. Leo Keaveny, Diocesan Superintendent of Schools, Cathedral Rectory, 316 Seventh Avenue, North.

SALT LAKE CITY, UTAH.—Rev. Joseph S. Keefe, Diocesan Superintendent of Schools, 650 South Eleventh East Street.

SAN DIEGO, CALIF.—

SCRANTON, PA.—Rev. J. J. Featherstone, Diocesan Superintendent of Schools, 315 Wyoming Avenue.

SIOUX CITY, IOWA.—Rev. C. Ivis, Diocesan Superintendent of Schools, St. Anthony's Home.

SIOUX FALLS, S. DAK.—Very Rev. Msgr. W. S. O'Meara, Diocesan Superintendent of Schools, Watertown, S. Dak.

SPRINGFIELD, ILL.—Rev. George M. Link, Diocesan Superintendent of Schools, 524 East Lawrence Avenue.

SPRINGFIELD, MASS.—Rev. John R. Rooney, Diocesan School Visitor, Chicopee Falls, Mass.
SUPERIOR, WIS.—Rev. Joseph Annabring, Diocesan Superintendent of Schools, 1201 Hughitt Avenue.
SYRACUSE, N. Y.—Rev. David C. Gildea, Diocesan Superintendent of Schools, 257 East Onondaga Street.
TOLEDO, OHIO.—Rev. Norbert M. Shumaker, Diocesan Superintendent of Catholic Schools, 58 Mettler Street.
TRENTON, N. J.—Rev. Michael A. Dalton, Diocesan Superintendent of Schools, 312 North Pearl Street, Bridgeton, N. J.
WHEELING, W. VA.—Rev. John J. O'Brien, Superintendent of Diocesan Schools, Sacred Heart Rectory, Salem, W. Va.
WICHITA, KANS.—Rev. Leon A. McNeill, Diocesan Superintendent of Schools, 307 East Central Avenue.
WILMINGTON, DEL.—Rev. Leo W. O'Neill, Diocesan Superintendent of Schools, 809 South Broom Street.

Continued Postponement vs. Immediate School-Building Program

BY IVAN A. BOOKER
Assistant Director, Research Division, National Education Association

IN the face of the serious shortage of school-building facilities generally known to exist,[1] some persons are advocating continued postponement of school-building operations, believing that the schools can get along with unsatisfactory—even hazardous—buildings until prosperity becomes more widespread. Others recommend an immediate school-building program, not elaborate or in excess of real needs, but extensive enough to supply school buildings wherever they are urgently needed. For several reasons this plan seems wiser.

Postponement Means Costly Educational Losses

First, and most important, we cannot afford longer to house millions of school pupils in structures that are a daily menace to their health and safety. The cost of an unwholesome school environment, reflected in superficial learnings and dwarfed personalities, is too great a price for any advantage that might seem to come from a build-later policy.

Construction Costs and Interest Rates Are Favorable Now

In the second place, from a dollars-and-cents point of view, no later period in the years immediately ahead is likely to be quite as favorable as the present for meeting school-building needs. Although construction costs have begun to rise, they still are low in comparison with the level which commonly prevails during periods of prosperity. Interest rates, too, are more favorable than they have been in years, and surely are lower than they will be when economic recovery is an accomplished fact. Unless there is a decided upturn in school-building operations in the near future, school finance is certain to enter again an unfortunate cycle similar to that which followed the World War. During the War, when enrolments were increasing rapidly, school-building construction was halted much as it has been during the past five years. The result was an accumulated shortage of school facilities which had to be provided in years when building costs and interest rates were high. The present financial problems of many school districts can be traced to the heavy debt burdens which this policy entailed. Should we again follow this blind course, leading on in the direction of an abnormal shortage of suitable facilities and an inevitable expansion of building operations when costs are higher and credit conditions less favorable than at present?

School-Building Construction Provides Much-Needed Employment

There are still other reasons why the construction of school buildings at the present time is desirable from an economic point of view. Private enterprises, including general building construction, have not been restored to the normal level. A crying need of the hour is for employment which will help to restore the purchasing power of those for whom private industry has no place. Recognizing this fact, the Federal Government is continuing its program of public works, based on the economic principle that during a period of depression a rise in government expenditures should help to offset the fall in private expenditures. To be sure, prosperity cannot be assured by this one step, but money spent by the Federal Government, or by school districts on needed school buildings, is just as effectual in rebuilding purchasing power as the wages paid by private employers. Every delay in school-building construction since 1930 has added to the unemployment problem, and further postponement of normal building operations is merely helping to delay recovery.

Federal Aid Can Sometimes Be Obtained

School districts in need of additional buildings, or needing to modernize old buildings, will do well to investigate the possibility of obtaining Federal aid. Both the Public Works Administration[2] and the Works Progress Administration[3] are extending financial aid to hundreds of school districts. It is estimated that PWA loans and grants totaling nearly $300,000,000 have been allotted on about 4,000 school-building projects. Grants of 45 per cent of the cost of the project, and loans at reasonable rates of interest, are available for projects meeting Federal approval. The chance of obtaining Federal aid is particularly good in communities where the unemployment problem is acute, and where few or no Federal relief projects of other types have been carried out. Whenever possible, school districts should of course cooperate with the Federal Government in providing work relief, which will at the same time result in needed improvement in schoolhousing facilities. A considerable amount of work for both skilled and unskilled relief workers can ordinarily be found, even though the district is not prepared to spend large sums for materials. Among such projects might be mentioned the grading, draining, or resurfacing of playgrounds; laying out tennis courts; setting out, pruning, or transplanting shrubs; laying out flower beds; building driveways or terraces; painting; cleaning; resurfacing floors; refinishing blackboards; pointing masonry; calking windows and doors; repairing furniture; repairing hardware and mechanical devices about school buildings; and repairing or improving the plumbing, heating or electrical systems.[4]

Each District Must Face Its Own Problems

When Federal aid is not available, there is but one alternate. The district must face its problems squarely and decide whether or not it is going to make adequate schoolhousing provisions now. Much depends on that decision. Neglect will be costly; not only as measured by future expenditures, but also as reflected in the lives of the children.

[1] See "The Nation's School Building Needs," *Research Bulletin* 13: 1-36 of the Research Division of the National Education Association, Washington, D. C., January, 1935.

[2] Applications for grants or loans must be filed with the state director of public works.

[3] Plans for work relief projects must be worked out with local relief administrators.

[4] For further suggestions see Linn, H. H., "Some Practical Suggestions for WPA Work in Public Schools." *American School Board Journal* 92: 27-29; March, 1936.

SECTION XVI

AIDS AVAILABLE TO LOCAL SCHOOL BOARDS FROM STATE DEPARTMENTS

PARTICIPATION OF STATE AGENCIES IN PLANNING AND SUPERVISING LOCAL SCHOOL-BUILDING DEVELOPMENT

IN the planning of buildings for a public school system, it frequently is desirable to know the degree to which the state board of education has provided for participation and cooperation. The following summary segregates the character of the supervision given by the state and its representative agencies under three headings. The first item indicates the action which the state board may be expected to take. The second item shows the part played by the state superintendent of schools as the official spokesman for the state department of education. In the third part will be found indications of the assistance or guidance which other state agencies will give. The form of tabulation has necessitated very brief statements covering these responsibilities, but the degree and character of participation are clearly shown for each state. The list has been revised up to December, 1936.

THE STATES' PARTICIPATION IN SCHOOL-BUILDING CONSTRUCTION

Alabama

State Board of Education, Montgomery
Approves rules and regulations submitted by state superintendent.
State Superintendent of Education, J. A. Keller
Prepares and submits to the state board of education rules and regulations pertaining to: minimum standards for school sites; minimum standards for plans, specifications, and construction of school buildings; for the issuance of warrants for capital outlay purposes.
Schoolhouse planning is a service in the division of administration and finance. In addition to the preparation of rules and regulations as listed above, the following services are rendered:
Plans and specifications are prepared for rural school building construction.
Plans and specifications prepared by private architects are approved.
Buildings in process of construction are inspected upon request to determine whether plans and specifications are being followed.
Rules and regulations of the state board are administered to insure the proper execution.
School surveys are carried on to provide the data for school building programs.
Each county is required to submit annually a building and capital outlay program which must be approved before actual work on the program is undertaken.
Director of the Division of Administration and Finance, E. L. Johns, Acting
Supervisor of Schoolhouse Planning, R. E. Ledbetter
Architect, Clyde C. Pearson

Arizona

State Board of Education, Phoenix
No jurisdiction whatever in regard to buildings erected by districts.
State Superintendent of Public Instruction, H. E. Hendrix
No jurisdiction.
Other Agencies
Board of health issues regulations.

Arkansas

State Board of Education, Little Rock
Has a division of school grounds and schoolhouse planning.
Director prepares plans for 1- to 7-teacher buildings, and for such buildings as teachers' homes, shops, home economics buildings, gymnasiums, etc.
Furnishes preliminary sketches of floor plans for larger buildings.
Checks architects' plans for school buildings upon request.
Advises school officials as to plans for remodeling, repairing and altering school buildings.
Advises superintendents and teachers as to interior arrangements, furniture and equipment.
Superintends the construction of all school buildings during progress of erection, except when the district employs an architect.
State Commissioner, W. E. Phipps
No legal provision for approval.
Director, School Plant Division, J. Odell Baker

California

State Superintendent of Public Instruction, Vierling Kersey, Sacramento
Division of schoolhouse planning passes on all plans costing more than $5,000, excepting those in the largest cities; is called into consultation by city districts, and controls other situations by surveys.
Site sizes and locations controlled by state standards.
No building contract, in situations coming under the department's jurisdiction, is legal without the required approval.
This department does not make working drawings.
Chief of Division of Schoolhouse Planning, Dr. Charles W. Bursch

Colorado

State Superintendent of Public Instruction, Mrs. Inez Johnson Lewis, Denver
School building handled by local boards of education.

Connecticut

State Board of Education, Hartford
Has a section of buildings and plans which approves plans for enlargement and new construction. It inspects school buildings for safety.
Publishes standards for guidance of local boards.
Has architect to whom plans are referred.
Assists local communities in building surveys.
State Commissioner, E. W. Butterfield
Assistant Supervisor of Buildings and Plans, John E. Nichols

Delaware

State Board of Education, Dover
Outside Wilmington prepares a tentative program of school building to submit to local boards.
Hears comments and suggestions thereon.
Creates standards with effect of law, governing hygienic, sanitary, and protective construction; selection, arrangement, and maintenance of sites; condemns school buildings.
Has approval of plans and specifications.
State Superintendent of Public Instruction, Dr. H. V. Holloway
Other Agencies
Legislature has created a state school-building act.
There is a state school-building account.

State school-building commission for each district.
Plans approved by state board of education and commission.
Buildings built by commission.
Construction supervised by commission.
Board of health has to approve drinking water and sewage disposal.

Florida

State Superintendent of Public Instruction, Colin English, Tallahassee
Has oversight, charge, and management of all matters pertaining to public schools, school buildings and grounds.
Director, Division of School Building Service, J. L. Graham

Georgia

State Superintendent of Schools, Dr. M. D. Collins, Atlanta
Furnishes plans and specifications for school-building guidance in local units.
Supervisor of schoolhouse construction prepares plans for 1- to 6-teacher buildings; prepares school ground plans; checks architects' plans; advises school officials.
Other Agencies
County superintendent and county board of education approve plans.

Idaho

State Board of Education, Boise
Standardization of:
Sanitary appliances
School furniture
School equipment and supplies
School buildings
Issues plans for 1-, 2-, 3-room buildings.
Requires approval of all plans.
State Superintendent, J. W. Condie
Member of state board of education and its executive officer.
Other Agencies
Department of public welfare has to cooperate with state board of education in its duties regarding schools.
County superintendent has power to require local trustees to conform to rules of state board "if there is money enough."
County board of health is responsible for sanitation in schools.

Illinois

State Superintendent of Public Instruction, John A. Wieland, Springfield
Prepares, with advice of state board of health, state architect, and state fire marshal, specifications for minimum requirements in heating, ventilation, lighting, seating, water supply, toilets, safety against fire.
These have force of law.
Other Agencies
State architect is required to assist the state superintendent of schools.
Enforcement of law is in the hands of county superintendents and local authorities.
County superintendent advises school officials in details of construction, but only on standards is it necessary to follow him.
County superintendent inspects buildings.
Board of directors and board of education required to submit plans to county superintendent.

Indiana

State Superintendent of Public Instruction, Floyd I. McMurray, Indianapolis
Other Agencies
Local school trustees erect buildings. Plans and specifications must be submitted to state board of health for approval of sanitation and hygiene; to state board of accounts for adequacy of specifications and fair competition; and to state fire marshal for compliance with state fire laws.
State board of health issues standards.

Iowa

State Superintendent of Public Instruction, Agnes Samuelson, Des Moines
Shall prepare and publish, when deemed necessary, a pamphlet containing suitable plans and specifications.

Kansas

State Board of Education, Topeka
"No provision in the laws to prevent the erection of undesirable buildings or to compel the discontinuance of buildings that should be abolished immediately, further than plans for all new school buildings must be submitted to the state architect as to provision for fire protection according to law." Section 421, Revised School Laws of Kansas for 1931.
Has adopted standardization of rural schools involving among other things: out-building; school-building equipment; and the school building itself.
State Superintendent of Public Instruction, W. T. Markham
Criticizes and approves plans submitted voluntarily by local authorities.
State Architect, Ray A. Coolidge

Kentucky

State Board of Education, Frankfort
Authorized to approve and adopt regulations for the sanitary and protective construction of public school buildings.
State Superintendent of Public Instruction, H. W. Peters
With concurrence of state board of health prepares regulations for the sanitary and protective construction of public school buildings. Prepares plans and specifications for 1- to 4-teacher public school buildings, for adoption by the state board of education. Examines and approves or disapproves plans and specifications submitted by county boards of education and graded boards of education.
Director of School Buildings and Grounds, J. W. Brooker

Louisiana

State Superintendent of Public Education, T. H. Harris, Baton Rouge
The state law requires approval of all school plans by the state superintendent. Plans must be drawn by licensed school architects.
Other Agencies
The state law requires that the school plans shall be approved by the state board of health, fire marshal, and parish school board.

Maine

State Commissioner of Education, Bertram E. Packard, Augusta
No school building can be built or repaired without his approval.
Provides plans for 1- to 4-room buildings free of cost.
Issues minimum requirements so that local units will be able to meet his approval of plans.
Other Agencies
No school building can be built or repaired without approval of board of health, where the expenditure is in excess of $50,000.

Maryland

State Board of Education, Baltimore
Elementary schools. Standardization includes grounds, buildings, lighting, heating and ventilation, library, equipment.
Has issued "Standards for School Buildings" as a guide to county superintendents.
State Superintendent of Schools, Dr. Albert S. Cook
Sites and plans must be submitted to him for approval, additions to buildings also.
After plans have been approved by the state consultant architect, the state superintendent issues certificate without which no building costing $300 or more can be erected (Sec. 30, Article 77, Annotated Code of Maryland).
Other Agencies
Plans must be submitted to state board of health for approval of sewage-disposal arrangements and plumbing.

Massachusetts

State Commissioner of Education, James G. Reardon, Boston
Assistants of superintendent do much in consulting with local committees. Loan slides.
Other Agencies
Department of public safety must approve all plans.
Department of public safety issues regulations.
Director of Buildings' Inspection Division, Department of Public Safety, J. J. Carey, State House, Boston

Michigan

State Department of Public Instruction, Lansing
Has issued standards.
Makes surveys, free of cost, of local situations before local board has decided what program should be, upon invitation. Provides administrative and professional leadership.
Provides complete plans and specifications free of charge for all 1- and 2-room buildings.
State Superintendent, Eugene B. Elliott

Minnesota

State Board of Education, St. Paul
Prints and distributes laws and rules governing public school buildings and sites.
Supplies inspection service and advises local school officials relative to school building problems in heating, ventilation, illumination, alteration, operation, maintenance, and financing.
Assists architects and public school officials in functional planning of school buildings.
Prepares and supplies gratis to school boards plans and specifications for one and two room school houses.
State Commissioner, John Gundersen Rockwell
Examines all plans and specifications with power of approval or otherwise.
Prescribes rules for schoolhouse construction, including therein rules of the board of health relative to sanitary standards for toilets, water-supply, and disposal of sewage.
He may condemn buildings under his own or the state board of education's rules.
Other Agencies
Division of sanitation, state board of health, examines and approves all school-building plans relative to water supply, sewage disposal and plumbing systems.
The law authorizes county superintendent to advise rural school boards in regard to buildings, ventilation, and school grounds.
Director, Division of Buildings and Business Administration, I. O. Friswold

Mississippi

State Department of Education, Jackson
Has a division of school building service. This division:
Cooperates in making surveys on the effective organization of schools.
Makes surveys to determine building needs.
Outlines building programs.
Approves architects' plans and specifications for school buildings.
Furnishes free plans and specifications for some small school buildings, teachers' homes and accessory buildings.
General advisory service on school-plant planning and equipment and on the effective use of the school plant.
State Superintendent, J. S. Vandiver
School Building Service, W. G. Eckles, State Director

Missouri

State Superintendent of Education, Jefferson City
Has prepared "Standards for Schoolhouse Planning and Construction," makes surveys of building needs, prepares and distributes plans and specifications for small buildings, aids in setting up requirements before plans are drawn for larger buildings, checks and approves all plans and specifications, maintains an advisory service on school-building insurance, school-building maintenance, including janitorial training service.
State Superintendent of Public Schools, Lloyd W. King
Other Agencies
The State Department of Public Health aids in checking the water supply.
Director of School Building Service, N. E. Viles

Montana

State Board of Education, Helena
Publishes a bulletin containing a list of standards for rating 1- and 2-room schools.
State Superintendent of Public Instruction, Ruth Reardon
Plans are furnished local boards by the board of health.

Nebraska

State Superintendent of Public Instruction, Charles W. Taylor, Lincoln
Prepares plans and submits suggestions for school-building programs upon request, but has no authority under the law to require districts to build according to certain specifications.

Nevada

State Department of Education, Carson City
Must prepare plans and specifications for rural schoolhouses on standard lines of school architecture as to size, lighting, heating, ventilation and general sanitation. The trustees of rural schools needing new schoolhouses shall be supplied with such plans and specifications upon request.
No public schoolhouse may be erected in any school district until the plans have been approved by the deputy superintendent of public instruction.
State Superintendent of Public Instruction, Chauncey W. Smith

New Hampshire

State Board of Education, Concord
State Commissioner, James N. Pringle
Interprets meaning of "suitable and sanitary" buildings for all schools. Has general authority to make regulations. Cooperates with superintendents and local school boards in planning buildings.
Recommends to state board of health investigation of unsuitable buildings.
Administrative Field Agent, Paul E. Farnum
Other Agencies
State board of health, on complaint, may condemn or order buildings improved at expense of districts.

New Jersey

State Board of Education, Trenton
Advice and consent to appointment of building inspector by commissioner of education.
Approves plans and specifications for all schoolhouse construction.
Has set up a school building code.
State Commissioner of Education, Dr. Charles H. Elliott
Appoints an inspector of school buildings, with advice and consent of state board of education.
May instruct county and city superintendents as to constructing schoolhouses and furnishing them.
Assistant Commissioner of Education, Charles D. Anderson
Supervisor and director of school finance, accounting, attendance and school buildings.
Inspector of School Buildings, Seymour Williams
Recommends approval of plans and specifications for schoolhouse construction.
Inspects all new construction and old buildings.
Advises local school officials on school building needs.
Assists in school building surveys.
Other Agencies
County superintendent has power "to note" conditions of schoolhouses, sites, etc., and advise with local boards in respect to construction, heating and ventilation, and lighting. May, with consent of commissioner of education, cause state moneys to be withheld where facilities are not in accord with legal requirements.
Local boards provide school buildings.

New Mexico

State Superintendent of Public Instruction, H. R. Rodgers, Santa Fe

New York

State Education Department, Albany
Has a division of school buildings and grounds with a director.
Has set up standards.
Board issues a pamphlet of information for local authorities.
Makes inspections of sites and school conditions before definite action is taken by local authority.
Advises with superintendents, principals, and boards in regard to needs and best way to meet them.
Examines preliminary plans.
State Commissioner, Dr. Frank P. Graves
All plans and specifications must receive the commissioner's approval in all districts other than first and second class cities.
He cannot approve unless plans conform to laws.
No tax can be levied until plans are approved.
Director of School Buildings and Grounds Division, Joseph H. Hixson

North Carolina

State Board of Public Instruction, Raleigh
There is a literary loan fund from which loans are made when plans are approved.
State department has a set of standards.
Has plans purchased from architects which it distributes free.
State Superintendent of Public Instruction, Clyde A. Erwin
All plans must be submitted to state superintendent for approval.
Other Agencies
Plans must also be submitted to insurance commission for approval, also to state board of health.

North Dakota

State Superintendent of Public Instruction, Arthur E. Thompson, Bismarck
Plans must be submitted to and approved by superintendent.

Ohio

State Director of Education, E. L. Bowsher, Columbus
Other Agencies
Has a state building code (very elaborate).
All plans must be approved by chief inspector of workshops and factories, except in cities having regularly organized building inspection departments.
District health commissioner checks plans for water-supply and sanitary arrangements. State department of health may make surveys and issue orders as to these matters.

Oklahoma

State Superintendent of Public Instruction, A. L. Crable, Oklahoma City
Prepares complete plans and specifications for the construction of all school buildings for four teachers or less, costing less than $10,000.
Makes school-building survey for all sizes of buildings.
Approves plans of all sizes but approval is not required by law.
Other Agencies
Standard building laws.
Book of 300 plans in hands of each county superintendent in the state.
Director of Schoolhouse Planning, Frank Williams

Oregon

State Superintendent of Public Instruction, C. A. Howard, Salem
Issues booklet giving suggested plans for 1-, 2-, and 3-room school buildings. No legal provision for the approval of the state department.
New bulletin on "The Construction and Care of School Buildings" will be sent this year to all school districts in the state.
Other Agencies
Plans for schools in third-class districts must be approved by county school superintendents.
County superintendents advise with the school boards relative to the construction, warming, ventilating, and arrangement of schoolhouses.

Pennsylvania

State Department of Public Instruction, Harrisburg
Has a division of school buildings.
Prescribes rules and regulations and has power to take such action as it may deem expedient to promote physical and moral welfare of school children.
Department code—
Required to approve plans in 2nd, 3rd, 4th class districts.
Supervises preparation of plans in local communities if asked to do so.
Submits, if asked, suggestive sketches.
State Superintendent of Public Instruction, Lester K. Ade
Other Agencies
State code.
Art commission passes on architectural design.
Department of labor and industry passes on fire and panic protection.
Chief, Division of School Buildings, Dr. HuBert C. Eicher

Rhode Island

State Director of Education, James F. Rockett, Providence
Part of the income of the permanent school fund may be apportioned by the director of education to assist towns in constructing model school buildings.

South Carolina

State Superintendent of Education, Dr. James H. Hope, Columbia
Division of schoolhouse planning and construction. Plans must be submitted to and approved by the director of schoolhouse planning.
The director inspects all plans and new buildings, and a certificate of approval is necessary before they can be used.
Plans and specifications and supervision of construction are furnished to small schools not employing an architect.
Other Agencies
Has a state building code.
Director of Schoolhouse Planning, S. P. Clemons

South Dakota

State Superintendent of Public Instruction, J. F. Hines, Pierre
Plans must be approved by him, and show heating and ventilation scheme. He assists in an advisory capacity in the planning of school buildings; he also helps boards in various ways to show their communities the needs of new buildings and additions to buildings.

Tennessee

State Commissioner of Education, Walter D. Cocking, Nashville
Division of schoolhouse planning furnishes working drawings and specifications for buildings up to and including four-teacher buildings. The division offers functional planning advice, and checks plans for larger buildings, where such service is requested.

Texas

State Board of Education, Austin
Purchases school district bonds or grants waiver for district to sell in open market.
State Superintendent, L. A. Woods
Administrative officer of public school laws and ex officio secretary of the state board, receives reports required by statute and is general superintendent of the business relating to the public schools.
Other Agencies
School-building code.
Plans must be submitted as follows for approval: (1) in a common school district—to the county superintendent; (2) independent district and city or town—to superintendent of schools.
These agencies report to state department what they have done and transmit evidence.
State Director of School Plant Division, J. Fred Horn
Prepares plans for 1- to 6-teacher buildings, and suggestive sketches for larger buildings; advises school officials; checks architects' plans; makes school-building surveys upon invitation; visits local units upon invitation.

Utah

State Board of Education, Salt Lake City
There are two department building codes.
First is in abeyance though not exactly discarded.
They have operated under the second one 5 years.
State Superintendent of Public Instruction, C. H. Skidmore
Is required to formulate a code to govern preparation of plans by local communities.
Is required to approve all building plans.
May hire an architect to examine plans or inspect buildings.

Vermont

State Board of Education, Montpelier
Public school buildings are standardized with "points" on buildings, grounds, equipment.
Plans "should be" submitted to state board.
Issues plans, pictures and bulletins.
State Commissioner, Francis L. Bailey
Other Agencies
Plans "must be" submitted to board of health.

Virginia

State Board of Education, Richmond
Has a division of school buildings.
Prepares plans and specifications for smaller towns and cities.
Supervises construction free of charge.
Minimum standards have been set up and approved.
Cooperates with local boards in:
(a) Preparing preliminary plans.
(b) Getting out final plans.
(c) Attendance at opening of proposals.
(d) Inspection every 2 weeks during construction, additional upon request of contractor or local board.
State Superintendent of Public Instruction, Dr. Sidney B. Hall
State Director, Division of Buildings, Raymond V. Long

Washington

State Superintendent of Public Instruction, Olympia
Has been given "some power" through law on "wider use of school plant."
State Superintendent of Public Instruction, Stanley F. Atwood
Other Agencies
County superintendents approve plans in 3rd class districts.

West Virginia

State Board of Education, Charleston
May require all plans and specifications for the erection of school buildings to comply with the requirements of law; and may require all county boards to submit all plans and specifications for the state board's approval.
State Superintendent of Free Schools, W. W. Trent

Wisconsin

State Department of Public Instruction, Madison

Under a cooperative agreement between the industrial commission and the department, all school plans are sent to the latter by the commission for checking and suggestive criticisms looking towards the erection of first class buildings.

Helps local communities by suggesting plans for all types of buildings to serve as a basis for extended work by commercial architects.

Service has been extended to cover expert advice on heating, ventilation, lighting.

The department develops complete plans and specifications and gives architectural service for 1- and 2-room rural schools on request.

Inspects all types of schools with a view to improving housing conditions and facilities; makes complete building surveys in all types of communities on request.

Gives field service and makes inspection upon request.

State Superintendent of Public Instruction, John Callahan

Other Agencies

The law requires submission of all school plans to industrial commission. This checking refers primarily to the application of the state building code and pays attention primarily to construction, safety and sanitation.

Supervisor of Buildings, H. W. Schmidt

Wyoming

State Superintendent of Public Instruction, Jack R. Gage, Cheyenne

Entrusted with general supervision of the public schools of the state. The commissioner of education works under his direction.

Commissioner of Education, B. L. Markley

He shall prepare for the use and guidance of the district board regulations and suggestions for standardizing and grading schools and for the hygienic and sanitary building of schoolhouses and the selection of sites.

The National Advisory Council on School Building Problems

OFFICERS AND MEMBERS, 1936-1937

OFFICERS

President
Arthur B. Moehlman, Professor of School Administration and Supervision, University of Michigan, Ann Arbor, Mich.

First Vice President
Charles L. Spain, Deputy Superintendent of Schools, Detroit, Mich.

Second Vice President
Leonard Power, Educational Consultant, New York City, N. Y.

Third Vice President
W. F. Credle, Director of School Buildings, State Department of Education, Raleigh, N. C.

Secretary
Alice Barrows, Specialist in School Building Problems, United States Office of Education, Washington, D. C.

EXECUTIVE COMMITTEE

(The Executive Committee consists of the above officers and the chairmen of the 11 regional councils.)

REGIONAL COUNCILS

New England

Chairman
Andersen, Erik A., Assistant Superintendent in Charge of School Buildings, Providence, R. I.

State Commissioner
Butterfield, Ernest W., Hartford, Conn.

City Superintendents
Moseley, Nicholas, Meriden, Conn.
Quinn, James J., Winchester, Mass.
Stoddard, A. J., Providence, R. I.

County Superintendent
Gardner, George R., Auburn, Me.

School Board Member
Sunderland, Philip, Danbury, Conn.

Architect (A.I.A. Regional Director)
Ripley, Hubert G., Boston, Mass.

New York

Chairman
Hixson, Joseph H., Director, School Buildings and Grounds Division, State Department of Education, Albany, N. Y.

State Commissioner
Graves, Frank P., Albany, N. Y.

City Superintendents
Bair, Frederick H., Bronxville, N. Y.
MacCalman, Kenneth R., Nyack, N. Y.
Spinning, James M., Rochester, N. Y.

County Superintendent
Tremper, William R. (Dist. Supt), Rhinebeck, N. Y.

School Board Member
Wood, Frank H., Chatham, N. Y.

Architect (A.I.A. Regional Director)
Voorhees, Stephen F., New York, N. Y.

Middle Atlantic

Chairman
Eicher, Hubert C., Director, School Buildings Division, State Department of Public Instruction, Harrisburg, Pa.

State Superintendent
Ade, Lester K., Harrisburg, Pa.

City Superintendents
Graham, Ben G., Pittsburgh, Pa.
Weglein, David E., Baltimore, Md.

County Superintendent
Broome, E. W., Rockville, Md.

School Board Member
Aaron, Marcus, Pittsburgh, Pa.

Architect (A.I.A. Regional Director)
Betelle, James O., Newark, N. J.

South Atlantic

Chairman
Long, Raymond V., Director of School-Building Construction, State Department of Education, Richmond, Va.

State Superintendent
Hall, Sidney B., Richmond, Va.

City Superintendents
Flora, A. Cline, Columbia, S. C.
Glenn, Charles B., Birmingham, Ala.
Hunter, Reid (Asst. Supt.), Atlanta, Ga.

County Superintendent
Kleazer, G. Miller, Columbia, S. C.

School Board Member
Hunter, Mrs. James Boyce, Charlotte, N. C.

Architect (A.I.A. Regional Director)
Warren, William T., Birmingham, Ala.

Great Lakes

Chairman
Holy, Thomas C., Bureau of Educational Research, Ohio State University, Columbus, Ohio.

State Superintendent
Elliott, Eugene B., Lansing, Mich.

City Superintendents
Jensen, Frank A., Rockford, Ill.
Lake, Charles H., Cleveland, Ohio.
Stetson, Paul C., Indianapolis, Ind.

County Superintendent
Drummond, Glenn, Bellefontaine, Ohio.

School Board Member
Earl, Otis A., Kalamazoo, Mich.

Architect (A.I.A. Regional Director)
Hewitt, Herbert E., Peoria, Ill.

Central States

Chairman
N. E. Viles, Director, School Building Division, State Department of Education, Jefferson City, Missouri.

State Superintendent
Vaughan, John, Oklahoma City, Okla.

City Superintendents
Crozier, N. R., Dallas, Tex.
Melcher, George, Kansas City, Mo.
Stout, A. J., Topeka, Kans.

County Superintendent
Sherman, Charles G., Watonga, Okla.

School Board Member
Todd, D. C., St. Louis, Mo.

Architect (A.I.A. Regional Director)
DeGelleke, Gerrit J., Milwaukee, Wis.

North Central

Chairman
Schmidt, H. W., Supervisor of High Schools and Buildings, State Department of Public Instruction, Madison, Wis.

State Superintendent
Weeks, I. D., Pierre, S. D.

City Superintendents
Anderson, Homer W., Omaha, Nebr.
Reed, Carroll R., Minneapolis, Minn.
Theisen, W. W. (Asst. Supt.), Milwaukee, Wis.

County Superintendent
Larson, Roy H., International Falls, Minn.

School Board Member
Huber, Jacob G., Sioux City, Ia.

Architect (A.I.A. Regional Director)
DeGelleke, Gerrit J., Milwaukee, Wis.

Gulf States

Chairman
Brooker, John W., Director of School Buildings and Grounds, State Department of Public Instruction, Frankfort, Ky.

State Superintendent
Cocking, Walter D., Nashville, Tenn.

City Superintendents
Bauer, Nicholas, New Orleans, La.
Hill, Henry, Lexington, Ky.
Ramsey, J. W., Fort Smith, Ark.

County Superintendent
Powers, Sue, Memphis, Tenn.

School Board Member
Howie, J. B., Gulfport, Miss.

Architect (A.I.A. Regional Director)
Cameron, Ralph H., San Antonio, Tex.

Northwestern

Chairman
Rice, Charles A., Superintendent of Schools, Portland, Oregon.

State Superintendent
Howard, C. A., Salem, Oregon.

City Superintendents
McClure, Worth, Seattle, Wash.
Pratt, Orville C., Spokane, Wash.
Vaughn, E. Norman, Pocatello, Idaho.

County Superintendent
Peterson, Fred, Klamath Falls, Oregon.

School Board Member
Glines, Mrs. G. M., Portland, Oregon.

Architect (A.I.A. Regional Director)
Ashton, Raymond J., Salt Lake City, Utah.

Rocky Mountain

Chairman
Skidmore, C. H., State Superintendent of Public Instruction, Salt Lake City, Utah.

State Superintendent
Threlkeld, A. L., Denver, Colo.

City Superintendents
Corning, H. M., Colorado Springs, Colo.
Hopkins, W. Karl, Ogden, Utah.
Milne, John, Albuquerque, N. Mex.

County Superintendent
McNeal, R. H., LaJunta, Colo.

School Board Member
Burgon, Heber J., Sandy, Utah.

Architect (A.I.A. Regional Director)
Ashton, Raymond J., Salt Lake City, Utah.

Sierra Nevada

Chairman
Bursch, Charles W., Chief, Division of Schoolhouse Planning, State Department of Education, Sacramento, Calif.

State Superintendent
Hendrix, H. E., Phoenix, Ariz.

City Superintendents
Ayer, J. Warren, Monrovia, Calif.
Case, R. D., Salinas, Calif.
Rose, C. E., Tucson, Ariz.

County Superintendent
York, Ada, San Diego, Calif.

School Board Member
Baskerville, Harry H., Los Angeles, Calif.

Architect (A.I.A. Regional Director)
Witmer, David J., Los Angeles, Calif.

SECTION XVII
ARCHITECTS FOR EDUCATIONAL BUILDINGS

All the architects listed in this Directory are now at work on educational buildings or have designed a number of school and college buildings in recent years.

No attempt has been made to evaluate the skill or professional standing of the architects listed. Boards of Education and persons interested in the construction of new buildings can obtain valuable advice in this matter from the presidents of the local chapters of the American Institute of Architects, or from the national headquarters of that organization, The Octagon, Washington, D. C., and from such sources as the National Advisory Council on School Buildings, the United States Office of Education, the respective state departments of education, the Department of Education of the National Catholic Welfare Conference, and the Department of Educational Administration of Teachers College, Columbia University, New York.

Alabama

Bessemer

T. J. Skinner, 2208 Dartmouth Ave.

Birmingham

John M. Gilfillan & Associates, Lyric Bldg.
Charles H. McCauley, Jackson Bldg.
Miller, Martin & Lewis, Title Guarantee Bldg.
W. A. Rayfield & Co., 328 St. George St., S.
Jack B. Smith, Steiner Bank Bldg.
M. E. VanArman, Martin Bldg.
E. B. Van Keuren, Inc., Farley Bldg.
Warren, Knight & Davis, Protective Life Bldg.

Florence

Ben F. Riley, III, Box 34

Gadsden

Paul W. Hofferbert, 220 S. 8th St.

Mobile

George B. Rogers, Van Antwerp Bldg.

Montgomery

Dittmar & Roberts, Vandiver Bldg.
Earle G. Lutz, Jr., 313 Catoma St.
Clyde C. Pearson, State Dept. of Education

Tuskegee

D. F. White

Tuskegee Institute

Louis E. Fry, Box 566

Arizona

Phoenix

Orville A. Bell, Heard Bldg.
Janssen & Whittlesley, Security Bldg.
Lescher & Mahoney, Title & Trust Bldg.

Tucson

Roy W. Place, 11 E. Pennington St.

Arkansas

Fort Smith

Bassham & Wheeler, Kennedy Bldg.
Haralson & Mott, Merchants Bank Bldg.

Little Rock

John P. Almand
Erhart & Eichenbaum, Gem Bldg.
A. N. McAninch, Pyramid Life Bldg.
Mann, Wanger & King, Donaghey Bldg.
Wittenberg & Delony, Southern Bldg.

California

Alhambra

Scott Quintin, Edison Bldg.
John Walker Smart, 39 E. Main St.

Bakersfield

Charles H. Biggar, Haberfelde Bldg.
Office of Edwin J. Symmes, Haberfelde Bldg.

Balboa Island

Donald Beach Kirby

Berkeley

John J. Donovan, 950 Parker St.
P. L. Dragon & C. R. Schmidts, 2068 Allston Way
W. H. Ratcliff, American Trust Bldg.

Chico

Chester Cole, 4418 2nd St.

Fresno

W. D. Coates, Rowell Bldg.
Franklin & Kump, Patterson Bldg.
Perrine & Mackie, Patterson Bldg. (also in Los Angeles)
Fred L. Swartz, Brix Bldg.

Fullerton

Harry K. Vaughn, 324 E. Wilshire St.

Hollywood

H. L. Gogerty, 6272 Yucca St.

Inglewood

Joseph Kaiser, Bank of Inglewood Bldg.

Long Beach

Clarence N. Aldrich, 1834 Dawson Ave.
Kirtland Cutter, F. & M. Bank Bldg.
D. Easton Herrald, 1st National Bank Bldg.
George W. Kahrs, 1224 Linden Ave.
Edward L. Mayberry, 3910 E. 3rd St.
Roger K. Nissen, 112 W. 6th St.
Schilling & Schilling, 151 Linden Ave.
Victor E. Siebert, 120 E. 3rd St.
Raymond A. Sites, F. & M. Bank Bldg.
H. C. Wildman, 3710 Lime Ave.
Kenneth S. Wing, 501 Termino Ave.

Los Angeles

George J. Adams, 5514 Wilshire Blvd.
Allison & Allison, Edison Bldg.
John C. Austin & Frederic M. Ashley, 1151 S. Broadway
C. A. Balch, 1584 W. Washington Blvd.
Barcume & King, 5369 Wilshire Blvd.
M. L. Barker & G. Lawrence Ott, 624 S. LaBrea Ave.
Richard M. Bates, Jr., 346½ S. La Brea Ave.
Henry E. Bean, 608 S. Hill St.
Claud Beelman, Union Bank Bldg.
Edwin Bergstrom, Citizens National Bank Bldg.
Horatio W. Bishop, 901 S. Wilton Pl.
Orville L. Clark, 369 N. Ridgewood Pl.
Harold Cross, 124 W. 4th St.
Pierpont & Walter S. Davis, 3215 W. 6th St.
H. C. Deckbar, 3200 W. 6th St.
C. K. Denman, Washington Bldg.
Paul J. Duncan, 624 S. La Brea St.
Wesley Eager, 816 W. 5th St.
Ralph C. Flewelling, 816 W. 5th St.
Gable & Wyant, 3723 Wilshire Blvd.
Albert B. Gardner, 11144 Aqua Vista, North Hollywood
Grant & Bruner, Ferguson Bldg.
William H. Harrison, 816 W. 5th St.
A. E. Harvey, 245½ S. Western Ave.
Earl Heitschmidt, 417 S. Hill St.
Hibbard, Gerity & Kerton, 816 W. 5th St.
Frank D. Hudson, Laughlin Bldg.
Myron Hunt & H. C. Chambers, 408 S. Spring St.
Sumner P. Hunt, Laughlin Bldg.
Arthur R. Hutchason, 816 W. 5th St.
Charles M. Hutchison, 108 W. 6th St.
Theodore R. Jacobs, 315 S. Broadway
Harold Johnson, Architects Bldg.
Office of Gordon B. Kaufman, 627 S. Carondelet St.
Paul Kingsbury, 516 N. Gower St.
T. C. Kistner, Architects Bldg.
Marshall R. Lawson, 424 S. Broadway
George M. Lindsey, 6305 Yucca St.
Samuel E. Lunden, Rowan Bldg.
Kenneth MacDonald, Jr., 3305 Wilshire Blvd.
Marsh, Smith & Powell, Architects Bldg.
Albert C. Martin, Higgins Bldg.
Marcus P. Miller, Board of Trade Bldg.
Armand Monaco, 446 S. Hill St.
Morgan, Walls & Clements, Van Nuys Bldg.
Arthur C. Munson, 433 S. Spring St.
Richard J. Neutra, 2348 Silverlake Blvd.
H. C. Newton & R. D. Murray, Architects Bldg.
Raphael A. Nicolais, 5670 Wilshire Blvd.
C. E. Noerenberg, Los Angeles Railway Bldg.
Llewellyn A. Parker, Architects Bldg.
John & Donald B. Parkinson, Title Insurance Bldg.
W. C. Pennell, 728 S. Hill St.
Perrine & Mackie, 1031 S. Broadway (also in Fresno)
Harry L. Pierce, 1443 Mt. Pleasant St.
Plummer, Wurdeman & Becket, 621 S. Hope St.
Thomas Franklin Power, 1414 N. Fuller Ave.
Alfred W. Rea & Chas. E. Garstang, Pacific Southwest Bldg.
Winchton L. Risley, 220 S. Westmoreland Ave.
A. F. Rosenheim, Chamber of Commerce Bldg.
W. F. Ruck, 940 S. Figueroa St.
W. J. and K. M. Saunders, 785 E. Pico St.
Frank R. Schaefer, 560 S. Main St.
Howard Schroder, 437 S. Hill St.
Harold O. Sexsmith, 6636 Hollywood Blvd.

C. F. Skilling, 2600 S. Hoover St.
Lester T. Squiers, Union League Bldg.
Edward Cray Taylor & Ellis Wing Taylor, 803 W. 3rd St.
Train & Cressey, 321 W. 3rd St.
Walker & Eisen, 437 S. Hill St.
Eugene Weston, Jr., Architects Bldg.
Austin Whittlesey, 816 W. 5th St.
Carleton Monroe Winslow, Architects Bldg.
Henry F. Withey, 407 S. Western Ave.
D. J. Witmer & L. F. Watson, 816 W. 5th St.
A. C. Zimmerman, Hellman Bldg.

Los Gatos
E. P. Whitman, 54 Cleland Ave.

Monrovia
Robert M. Finlayson, Central Bldg.

Oakland
Will G. Corlett, Bank of America Bldg.
Chester H. Treichel, 696 Cleveland St.

Palo Alto
B. M. Clark & David B. Clark, 310 University Ave.

Pasadena
Robert H. Ainsworth, Central Bldg.
Elmer Grey, 170 E. California St.
Frederick Kennedy, Jr., 1041 E. Green St.
Marston & Maybury, 25 S. Euclid Ave.

Petaluma
Brainerd Jones, 226 Washington St.

Rancho Santa Fe
Lillian J. Rice

Redding
Casebolt Dakin, Box 367

Richmond
James T. Narbett, 474 31st St.

Riverside
G. Stanley Wilson, 3616 Main St.

Sacramento
W. E. Coffman, Forum Bldg.
Charles S. Dean, California State Life Bldg.
Harry J. Devine, Cronan Bldg.
George C. Sellon, California State Life Bldg.
Starks & Flanders, Bank of America

Salinas
Charles E. Butner, 7 Winham St.
C. J. Ryland, Salinas National Bank Bldg. (also in Monterey)

San Bernardino
E. Charles Parke, Fuller Bldg.
Martin C. Parker, 1798 Pershing Ave.
Worswick & Culver, Fuller Bldg.

San Diego
H. Louis Bodmer, Commonwealth Bldg.
Louis J. Gill, Sefton Bldg.
Frank L. Hope, Jr., Commonwealth Bldg.
Jackson & Hamill, Bank of America Bldg.
William P. Lodge, Fifth Avenue Bldg.
John S. Siebert, Granger Bldg.
F. W. Stevenson, Spreckels Bldg.
William H. Wheeler, San Diego City Schools

San Francisco
Arthur Brown, Jr., 251 Kearny St.
Norman R. Coulter, 46 Kearny St.
O. A. Deichmann, 110 Sutter St.
Thos. M. Edwards, 9 Geary St.
Wm. C. Hays, 1 Montgomery St.
George W. Kelham, 315 Montgomery St.
G. Albert Lansburgh, 321 Bush St.
Masten & Hurd, 233 Post St.
Maybeck & White, 235 Montgomery St.
Miller & Pflueger, 580 Market St.
William Mooser, 681 Market St.
E. L. Norberg, 580 Market St.
Frederick H. Reimers, 233 Post St.
Resing & McGuinness, 488 Pine St.
Martin Rist, Phelan Bldg.
N. W. Sexton, De Young Bldg.
William H. and Harold H. Weeks, 525 Market St.

San Jose
Ralph Wyckoff, Anglo Bank Bldg.

San Pedro
William F. Durr, 128½ W. 6th St.

Santa Ana
Austin & Wildman, Spurgeon Bldg.
Frederick H. Eley, 109 Orange Ave.
Fay R. Spangler, Spurgeon Bldg.

Santa Barbara
E. Keith Lockard, 117 E. De La Guerra St.
Soule & Murphy, 116 East Sola St.

Santa Maria
Louis N. Crawford, Gibson-Drexler Bldg.

Santa Paula
Roy C. Wilson, Box 941

Santa Rosa
W. Herbert, Rosenberg Bldg.

South Pasadena
A. S. Nibecker, Jr., 1624 Bushnell Ave.

Stockton
Elmore G. Ernst, 9 W. Cleveland St.
Frank V. Mayo, 931 Eldorado St.

Ventura
Harold E. Burket, 468 E. Main St.

Whittier
R. L. Warren, 115 E. Philadelphia St.

Wilmar
J. A. Larralde, 2231 Del Mar Ave.

Colorado

Colorado Springs
Charles E. Thomas, Colorado Springs National Bank Bldg.

Denver
J. B. Benedict, 1669 Broadway
William N. Bowman, Inc., Insurance Bldg.
T. H. Buell & Co., 730 14th St.
H. W. J. Edbrooke, Tabor Bldg.
M. S. Fallis Architect Co., 624 Ogden St.
W. E. and A. A. Fisher, Denver National Bldg.
Robert K. Fuller, Insurance Bldg.
Eugene G. Groves, Temple Court Bldg.
F. W. Ireland, Jr., 1145 St. Paul St.
Morris & Frewen, Midland Savings Bldg.
G. Meredith Musick, Republic Bldg.
C. Francis Pillsbury, Midland Savings Bldg.
Gordon D. White, 615 Columbine St.

Pueblo
Walter DeMordaunt, Thatcher Bldg.
John Gray, 612 Van Buren St.

Trinidad
Francis W. Spencer & Roy W. Vorhees, Box 156

Connecticut

Bridgeport
Frederick H. Beckwith, 19 Arcade Balcony

Danbury
P. N. and W. W. Sunderland, 81 West St.

Hartford
Isaac A. Allen & Son, Inc., 100 Farmington Ave.
S. W. Haynes & Associates, 36 Pearl St. (also in Fitchburg, Mass.)
Wm. D. Johnson, 174 Bond St.
Carl J. Malmfeldt, 36 Pearl St.
William T. Marchant, 36 Pearl St.
John J. McMahon, 187 Barker St.
Frank Warren Whiton, 805 Main St.

Litchfield
Ernest Sibley

Meriden
Lorenzo Hamilton, Inc., 22 Church St.

Middletown
Lamb & Segerberg, 438 Main St.
Wm. Thomas Towner, 329 Main St.

New Haven
R. W. Foote, 185 Church St.
Joseph A. Jackson, 184 Livingston St.
Kelly & Kelly, 185 Church St.
Douglas Orr, 96 Grove St.
Schilling & Goldbecker, 98 College St.

New London
A. Graham Creighton, 140 State St.
Payne & Keefe, Manwaring Bldg.

Norwich
Office of Chandler & Palmer, Thayer Bldg.

Stamford
Emmens & Abbott, 165 Bedford St.
William J. Provoost, 421 Main St.

Waterbury
Louis A. Walsh, 111 W. Main St.

Delaware

Wilmington
Brown & Whiteside, DuPont Bldg.
Wallace E. Hance, 1222 Market St.
E. W. Martin, DuPont Bldg.
Massena and DuPont, 921 Market St.

District of Columbia

Washington
Rhees E. Burket, 726 Jackson Pl.
Albert I. Cassell, Howard University
H. W. Cutler, 1108 16th St., N. W.
Waldron Faulkner, 917 15th St.
Philip H. Frohman, 726 Jackson Pl.
Donald S. Johnson
Hillyard R. Robinson & Paul R. Williams, 1901 7th St., N. W.
A. B. Trowbridge, 917 15th St.
Upman & Adams, 744 Jackson Pl., N. W.
Nathan C. Wyeth, Municipal Architect, District Bldg.

Florida

Daytona Beach
Harry M. Griffin, 309 N. Grandview Ave.

Fort Myers
Nat Gaillard Walker, 1127 First St.

Gainesville
Rudolph Weaver, University of Florida

Jacksonville
R. A. Benjamin, Bisbee Bldg.
S. Ralph Fetner, 218 W. Church St.
Jefferson D. Powell, Professional Bldg.

Lakeland
Albert J. Poteet, Box 437

Miami
Kiehnel & Elliott, Seybold Bldg.
Henry J. Moloney, Professional Bldg.

Miami Beach
August Geiger, 731 Lincoln Rd.
Robert A. Taylor, 605 Espanola Way

Ocala
Frank A. Parziale, Robertson Bldg.

Orlando
Philip F. Kennard, Box 113
Maurice E. Kressly, Smith Bldg.
W. Kenneth Miller, 206 Washington Street Arcade

Pensacola
S. J. Welch, 1306 E. Jackson St.
Yonge & Hart, Thiesen Bldg.

St. Petersburg
Henry L. Taylor, Empire Bldg.

Stuart
Bert D. Keck, 206 Atlanta Ave.

Tallahassee
E. D. Fitchner, 650 E. College Ave.
T. Angus MacEwan, 546 W. College Ave.

Tampa
M. Leo Elliott, Inc., Tampa Gas Bldg.

Winter Park
Harold Hair, 222 Park Ave.

Georgia

Atlanta
Dept. of Architecture, Georgia School of Technology
Wm. J. J. Chase, 140 Peachtree St.
Daniell & Beutell, Georgia Savings Bank Bldg.
Edwards & Sayward, 101 Marietta Street Bldg.
Chas. H. Hopson & Ross H. Howard, Associate, Healey Bldg.
Ivey & Crook, Candler Bldg.
Henry H. Jordan, Healey Bldg.
Alvin Roger Moore, Haas-Howell Bldg.
Otis Clay Poundstone, 101 Marietta St.
G. Floyd Preacher Co., Inc., Wynne-Claughton Bldg.
Pringle & Smith, Norris Bldg.
Arthur Neal Robinson, Henry Grady Bldg.
Jess Wilhoit, Mortgage Guarantee Bldg.

Augusta
Willis Irvin, S. F. C. Bldg.
Merry & Parsons, S. F. C. Bldg.
Scroggs & Ewing, S. F. C. Bldg.
Elroy G. Smith, 746 Reynolds St.

Brunswick
Francis L. Abreu, Perry Bldg.

Columbus
F. Roy Duncan, 3119 Hamilton Ave.
T. F. Lockwood, Murrah Bldg.

Fitzgerald
Lauren Parrott

Macon
Dennis & Dennis, 556 Mulberry St.
W. Elliott Dunwody, Jr., 460 Broadway
Ellamae Ellis League, Grand Bldg.

Savannah
Cletus W. Bergen, Liberty Bank Bldg.
Levy & Clarke, 203 E. Broughton St.
Walter P. Marshall, 1108 E. Henry St.
Henrick Wallin, 408 E. Bay St.

Valdosta
Lloyd Greer, 108 S. Patterson St.

Idaho

Boise
Ernest H. Gates, 511 Warm Springs St.
Tourtellotte & Hummel, Eastman Bldg.
Wayland & Fennell, Box 1277

Idaho Falls
Sundberg & Sundberg

Lewiston
Hugh Richardson, Weisgerber Bldg.

Nampa
Lee R. Cooke, 1222 1st St., S.

Pocatello
Frank H. Paradice, Jr., Pourtneuf Bldg.

Illinois

Aurora
Frank B. Gray, 73 S. LaSalle St.
W. J. van der Meer, 70 S. May St.

Belleville
Rubach & Weisenstein, Belleville Bank & Trust Bldg.

Bloomington
Lundeen & Roozen, Corn Belt Bank Bldg.
Schaeffer & Hooton, Peoples Bank Bldg.

Cardondale
Thos. S. Thompson, Box 123

Champaign
F. E. Berger & R. L. Kelley, 44 Main St.
George E. Ramey & Co., Robeson Bldg.

Chicago
Armstrong, Furst & Tilton, 11 S. LaSalle St.
Gerald A. Barry, 4929 Augusta Blvd.
Charles Bohasseck, 30 N. Michigan Ave.
Burnham Brothers & Hammond, Inc., 160 N. LaSalle St.
Melville C. Chatten, 160 N. LaSalle St.
Childs & Smith, 430 N. Michigan Ave.
John C. Christensen, Board of Education, 228 N. LaSalle St.
John D. Chubb, 109 N. Dearborn St. (also in Marquette, Mich.)
W. Fred Dolke, 189 W. Madison St.
Floyd E. Dougherty, 79 W. Monroe St.
George G. Elmslie, 122 S. Michigan Ave.
Stanley D. Fairclough, 819 Exchange St.
Granger & Bollenbacher, 333 N. Michigan Ave.
Hall & Stromquist, 175 W. Jackson Blvd.
Hamilton, Fellows & Nedved, 814 Tower Court
Charles Hodgdon & Son, 111 W. Monroe St.
Holabird & Root, 333 N. Michigan Ave.
Holmes & Flinn, 8 S. Dearborn St.
Holsman & Holsman, 140 S. Dearborn St.
Emil Liska, 30 N. Michigan Ave.
Joseph C. Llewellyn Co., 38 S. Dearborn St.
Benj. Franklin Olson, 19 S. LaSalle St.
Oman & Lilienthal, Tribune Tower
Clement L. Piontek, 1608 Milwaukee Ave.
Pond, Pond & Edgar Martin, 180 N. Michigan Ave.
James B. Rezny & Adrian Rezny, 2202 S. Crawford Ave.
E. E. Roberts & Elmer C. Roberts, Inc., 82 W. Washington St.
Monroe R. Sandel, 10 E. Huron St.
K. M. Vitzthum & Co., 1 N. LaSalle St.

Decatur
Aschauer & Waggoner, Citizens Bldg.
Brooks, Bramhall & Dague, 254 E. Main St.
S. A. Clausen, Standard Bldg.
Charles Harris, Standard Office Bldg.

East St. Louis
John W. Kennedy, First National Bank Bldg.

Elgin
Leroy W. Thompson, 735 St. John St.

Evanston
Dwight H. Perkins, 2319 Lincoln St.

Galesburg
Aldrich & Aldrich, Bondi Bldg.

Highland
Knoebel & Pabst, State & Trust Bank Bldg.

Highland Park
John S. Van Bergen, 234 Cedar Ave.

Joliet
Webster Tomlinson, Morris Bldg.

Kewanee
John A. Scribbins, 303 McKinley Ave.

Lake Forest
Anderson & Ticknor, Inc., 262 E. Deerpath Ave.

La Salle
John Hanifen, 225 Gooding St.

Lincoln
Deal & Ginzel, Box 406

Maywood
John A. Chiaro, 12 N. 5th Ave.

Metropolis
S. Lester Daly, 708 Market St.

Moline
M. R. Beckstrom, Reliance Bldg.
William H. Schulzke, Fifth Avenue Bldg.

Mt. Vernon
Wm. R. McCoy, First National Bank Bldg.

Murphysboro
R. Z. Gill & Co., 1328½ Walnut St.

Ottawa
Norman W. Cook, 700 Webster St.
Louis H. Gerding, 708 LaSalle St.

Peoria
Hamilton B. Dox, Lehmann Bldg.
Hewitt, Emerson & Gregg, Alliance Life Bldg.
Robert J. Hotchkiss, Central National Bank Bldg.
Jameson & Harrison, Alliance Life Bldg.

Quincy
Martin J. Geise, 109 N. 8th St. (also in Keokuk, Iowa)

Rockford
Raymond A. Orput
Peterson & Johnson

Rock Island
Cervin & Stuhr, Safety Bldg.
Benj. A. Horn, Rock Island Bank Bldg.
Ed. Lerch, 2211 26th St.

Springfield
Harry J. Reiger, Security Bldg.

Urbana
Royer & Danley, Urbana-Lincoln Hotel
Smith, Kratz & Strong, 101 S. Broadway

Waukegan
Ekstrand & Schad, 100 S. Genesee St.

Wheaton
Robert H. Salisbury, Liberty Bldg.

Indiana

Anderson
E. F. Miller, Anderson Bank Bldg.
Ernest R. Watkins, Citizens Bank Bldg.

Bedford
O. L. Hill, Box 274

Bloomington
Wm. J. Strain, 104½ E. 5th St.

Connersville
W. Erb Hanson Co.

Crawfordsville
Carroll O. Beeson, Ben Hur Bldg.

Crown Point
Turner & Bohling, 116 N. East St.

Dana
H. L. Fillinger, First National Bank Bldg.

East Chicago
Karl D. Norris, Calumet Bldg.

Elkhart
Gerald C. Brubaker, 360 Goshen Ave.

Evansville
Edwin C. Berendes & Assoc., 121 N. W. 4th St.
Harry E. Boyle & Co., Furniture Bldg.
Edward J. Thole, Furniture Bldg.
Charles L. Troutman, American Trust Bldg.

Fort Wayne
Le Roy Bradley, 221 W. Wayne St.
Griffith & Goodrich, 206 E. Jefferson St.
Pohlmeyer & Pohlmeyer, Central Bldg.
A. M. Strauss, Calwayne Bldg.

Frankfort
Leonard & Wolf, 241 Ross Block

Gary
Joe H. Wildermuth & Co., 527 Broadway

Hammond
W. S. Hutton, 5231 Hohman Ave.

Huntington
Robert W. Stevens, Cherry St.

Indianapolis
D. A. Bohlen & Son, Majestic Bldg.
Everett I. Brown, 957 W. D. Woodruff Pl.
Burns & James, 333 N. Pennsylvania St.
Robert F. Daggett, 445 N. Pennsylvania St.
Russell N. Edwards, 157 E. 71st St.
Herbert Foltz & Son, Architects Bldg.
J. Edwin Kopf & Deery, Indiana Pythian Bldg.
McGuire & Shook, Fletcher Trust Bldg.
Pierre & Wright, Architects Bldg.
Geo. F. Schreiber, 2915 N. Pennsylvania St.
C. D. J. Zimmerman & Associates, 3538 N. Meridian St.

Kentland
John A. Bruck

Lafayette
Frank P. Riedel, 716 S. 12th St.
Walter Scholer, 1114 State St.

Lowell
M. Clifford Wiley

Michigan City
John Lloyd Wright, Long Beach

Muncie
Garrard & Keely, 118 E. Adams St.
Houck & Hamilton, Patterson Bldg.

New Albany
Hawkins & Walker, Elsby Bldg.

New Carlisle
Virgil J. Rodgers, Olive School Township

Notre Dame
Francis W. Kervick

Richmond
Werking & Son, 2000 E. Main St.

South Bend
Austin & Shambleau, J. M. S. Bldg.
Willard M. Ellwood, Christman Bldg.
R. V. & H. V. Maurer, 107 Lincolnway, E.
Callix E. Miller, Union Trust Bldg.

Terre Haute
Miller & Yeager, Opera House Bldg.

Vincennes
Sutton & Routt, Citizens Trust Bldg.

Iowa

Ames
Allen Holmes Kimball, 213 Engineering Annex

Burlington
Robin B. Carswell, Iowa State Bank Bldg.

Cedar Rapids
Mark Anthony, O. R. C. Bldg.
W. J. Brown, Higley Bldg.
Norman Hatton, Higley Bldg.

Davenport
Arthur H. Ebeling, Kahl Bldg.
Kruse & Klein, Kahl Bldg.
Howard S. Muesse, Davenport Bank Bldg.

Decorah
Charles Altfillisch, 126½ W. Water St.

Des Moines
Dougher, Rich & Woodburn, Old Colony Bldg.
Keffer & Jones, Masonic Temple.
Proudfoot, Rawson, Brooks & Borg, Hubbell Bldg.
Oren Thomas, Des Moines Bldg.
Tinsley, McBroom & Higgins, Hubbell Bldg.

Dubuque
C. I. Krajewski, Roshek Bldg.

Forest City
Thorwald Thorson

Fort Dodge
Frank W. Griffith, Snell Bldg.

Keokuk
Martin J. Geise, State Central Saving Bank (also in Quincy, Ill.)

Mason City
Hansen & Waggoner, 11½ S. Federal Ave.

Ottumwa
George M. Kerns, 211 E. 2nd St.

Sioux City
Beuttler & Arnold, Insurance Exchange Bldg.
Geo. B. Hilgers, Warnock Bldg.
E. R. Swanson, Insurance Exchange Bldg.

Waterloo
C. W. Irwin, Lafayette Bldg.
Ralston & Ralston, Waterloo Bldg.

Kansas

Abilene
Murray & Cayton, Citizens Bank Bldg.

Emporia
Brinkman & Hagen, Citizens Bank Bldg.

Fredonia
Garrold A. Griffin

Hutchinson
W. E. Hulse, 19 N. Poplar St.
Otho McCrackin, 308 W. 20th St.
Mann & Co., Wiley Bldg.
Smith & English, Nelson Bldg.

Independence
Leonard Paul Osborn, 813½ N. Penn Ave.

Kansas City
D. B. Peterson, 721 Minnesota Ave.
Jos. W. Radotinsky, Commercial National Bank

Lawrence
Thomas Larrick & E. J. Wolpert, Assoc., 816 Massachusetts St.

Manhattan
Paul Weigel, Kansas State College

Salina
Ben H. Byrnes, National Bank of America Bldg.
Chas. W. Shaver, United Life Bldg.

Topeka
Raymond A. Coolidge, State Architect
Cuthbert & Suehrk, 735 Kansas Ave.
Ray L. Gamble, Central Bldg.
W. E. Glover, National Reserve Bldg.
Ralph E. Scamell, National Reserve Bldg.
Thomas W. Williamson, National Bank Bldg.

Wichita
Ed. Forsblom, Beacon Bldg.
R. J. Hamilton, Brown Bldg.
Overend & Boucher, Brown Bldg.
Glen H. Thomas, 125½ N. Topeka Ave.
S. S. Voight, 122 S. Broadway

Kentucky

Ashland
H. Clell Hayes, Second National Bank

Crestwood
J. Meyrick Colley

Frankfort
Leo L. Oberwarth & Sons, 301 W. 2nd St.

Hopkinsville
John T. Waller, 1700 S. Virginia St.

Lexington
Wm. B. Brock, City Bank Bldg.
Frankel & Curtis, Citizens Bank Bldg.
John T. Gillig, Walton Bldg.
Whayne W. Haffler, 414 Fayette Park
Hugh Meriwether, Walton Bldg.
John F. Wilson, 131 W. Short St.

Louisville
Brinton B. Davis, 4th and Main Sts.
E. T. Hutchings & E. R. Gregg, Heyburn Bldg.
Joseph & Joseph, Breslin Bldg.
Arthur G. Tafel, 140 S. 3rd St.

Owensboro
Walter Scott Roberts, Masonic Bldg.

Paducah
G. Tandy Smith, Guthrie Bldg.

Louisiana

Alexandria
Herman J. Duncan & Co., Inc., Masonic Dr.
Charles T. Roberts, Guaranty Bank Bldg.

Baton Rouge
Bodman & Murrell, Reymond Bldg.

Monroe
J. W. Smith & Associates, Ouachita Bank Bldg.

New Orleans
Bendernagel & Cazalé, 8 Marlborough Gate
William R. Burk, 7831 Plum St.
Favrot & Reed, Nola Bldg.
Moise H. Goldstein, American Bank Bldg.
Landry & Lockett (also in Hattiesburg, Miss.)
William T. Nolan, Queen & Crescent Bldg.
Weiss, Dreyfous & Seiferth, Maison Blanche Bldg.

Shreveport
J. P. Annan & Son, 808 Ontario St.
Jones, Roessle, Olschner & Wiener, Ardis Bldg.
Edward F. Neild, City Bank Bldg.

Winnsboro
John W. Baker

Maine

Augusta
Bunker & Savage, 256 Water St.

Bangor
Crowell & Lancaster, 6 State St.

Lewiston
Harry S. Coombs & Alonzo J. Harriman, 11 Lisbon St.

Portland
Miller & Beal, Inc., 465 Congress St.
John Calvin & John H. Stevens, 187 Middle St.

Presque Isle
John C. Levasseur, Main St.

Maryland

Baltimore
O. Eugene Adams, 509 Edgewood Rd., Roland Park
Charles M. Anderson, 36 Whitfield Rd.
Benjamin Frank, 15 W. Franklin St.
Clyde N. & Nelson Friz, Lexington Bldg.
Lucien E. D. Gaudreau, 527 N. Charles St.
Henry Powell Hopkins, 10 E. Mulberry St.
Herbert G. Jory, Munsey Bldg.
Hugh I. Kavanagh, 913 N. Calvert St.
Owens & Sisco, Mercantile Trust Bldg.
Henry G. Perring Co., 10 W. Chase St.
Roland Park Co., 4810 Roland Ave.
Smith & May, Baltimore Trust Bldg.
Taylor & Fisher, 1012 N. Calvert St.
Lucius R. White, Jr., 10 W. Chase St.
Wrenn, Lewis & Jencks, 113 W. Mulberry St.
Wyatt & Nolting, Keyser Bldg.

Cumberland
Robert H. Hitchins, 49 N. Mechanic St.

Elkton
E. William Martin-Ralph A. Jeffers

Hagerstown
A. J. Klinkhart, Kohler Bldg.

Salisbury
Edwin Wilson Booth, Box 483
Malone & Williams

Takoma Park
Ronald Senseman, 504 Flower Ave.

Massachusetts

Boston
Adden, Parker, Clinch & Crimp, 177 State St.
Allen, Collens & Willis, 75 Newbury St.
Andrews, Jones, Biscoe & Whitmore, 50 Congress St.
Harrison H. Atwood, 61 Alban St.
J. Williams Beal, Sons, 185 Devonshire St.
Robert P. Bellows, 8 Park St.
Parker J. Brown, 51 Cornhill St.
William B. Colleary, 80 Boylston St.
Coolidge & Carlson, 89 State St.
Coolidge, Shepley, Bulfinch & Abbott, 1 Court St.
Frank Irving Cooper Corp., 47 Winter St.

Cram & Ferguson, 248 Boylston St.
Ralph Harrington Doane, 60 Batterymarch St.
M. A. Dyer Co., 1 Beacon St.
J. M. Gray Co., 175 High St.
Chas. R. Greco, Inc., 11 Beacon St.
John P. Heffernan, 131 State St.
Ralph Coolidge Henry, 11 Beacon St.
Hutchins & French, 11 Beacon St.
Ralph Jackson, 85 River St.
Kendall Taylor & Co., 209 Columbus Ave.
Kilham, Hopkins & Greeley, 126 Newbury St.
A. F. Law-W. P. Blodget, 69 Newbury St.
Edmund I. Leeds, 5 Park Sq.
McLaughlin & Burr, 88 Tremont St.
Maginnis & Walsh, Statler Bldg.
Perry, Shaw & Hepburn, 141 Milk St.
Benjamin Proctor, Jr., 173 Milk St.
Putnam & Cox, 114 State St.
Isidor Richmond, 248 Boylston St.
Louis Warren Ross, 9 Park St.
Richard Shaw, 25 Huntington Ave.
George H. Sidebottom, 137 Newbury St.
Sturgis Associates, 120 Boylston St.
Oscar A. Thayer, 171 Newbury St.

Egypt

Edward I. Wilson, 453 Tilden Rd.

Fall River

Israel T. Almy, 56 N. Main St.
Edward M. Corbett, 49 Purchase St.
Henry Fallows, 131 Stewart St.
E. I. Marvell, 209 Bedford St.

Fitchburg

S. W. Haynes & Associates, Main St. (also in Hartford, Conn.)

Lawrence

Office of James E. Allen, 351 Essex St.
Ashton & Huntress, 477 Essex St.

Leominster

Harold E. Mason, 15 Prospect St.

Lowell

Perley F. Gilbert, 53 Central St.
Harry Prescott Graves, 40 Middlesex St.
Henry L. Rourke, Hildreth Bldg.

Lynn

George A. Cornet, 14 Central Ave.

Marblehead

William H. Quiner

New Bedford

Brown & Poole, 688 Pleasant St.
William Tallman, 222 Union St.

Pittsfield

Harding & Seaver, 126 Fenn St.

Shelburne Falls

Arthur E. Eldridge, 119 Main St.

Springfield

D. R. Baribault, 166 Buckingham St.
Gardner & King, 33 Lyman St.

Wellesley

William H. Brainerd, 10 Upland Rd.

Westfield

Malcolm B. Harding, 6 Main St.

Worcester

Lucius W. Briggs Co., 314 Main St.
Edwin T. Chapin, 311 Main St.
Frost, Chamberlain & Edwards, Slater Bldg.
Harry L. Meacham Associates, 120 Front St.
O. E. Nault & Sons, 48 Hamilton St.

Michigan

Ann Arbor

Fry & Kasurin, First National Bank Bldg.

Battle Creek

A. B. Chanel, 9 Merwood Dr.
Lewis J. Sarvis, Bailey Bldg.

Bay City

Joseph C. Goddeyne, Bay City Bank Bldg.

Berrien Springs

Vernon S. Watson, R. 2

Dearborn

Bennett & Straight, Schaefer Bldg.

Detroit

Derrick & Gamber, Inc., Union Guardian Bldg.
Donaldson & Meier, 1601 Washington Blvd. Bldg.
Frank Eurich, Jr., Detroit Bank Bldg.
Aloys Frank Herman, Owen Bldg.
Arthur K. Hyde, 3105 E. Grand Blvd.
Albert Kahn, Inc., New Center Bldg.
Louis Kamper, Inc., Book Tower
H. T. Keyes, Free Press Bldg.
Lane-Davenport-Meyer, Donovan Bldg.
Lyndon & Smith, Robert Oakman Bldg.
McGrath & Dohmen, 3648 Mt. Elliott Ave.
Malcolmson & Higginbotham, 1217 Griswold St.
George D. Mason & Co., 409 Griswold St.
Merritt & Cole, 1111 Collingwood Ave.
O'Dell & Rowland, Marquette Bldg.
George L. W. Schulz, Board of Education, 1354 Broadway
Smith, Hinchman & Grylls, Inc., Marquette Bldg.
N. Chester Sorensen, Industrial Bank Bldg.
J. Robert F. Swanson, Union Guardian Bldg.
Alex Linn Trout, Penobscot Bldg.
B. C. Wetzel & Co., Dime Bank Bldg.

Grand Rapids

Roger Allen, Grand Rapids National Bank
J. & G. Daverman, 40 Porter Blk.
Knecht, McCarty & Thebaud, 154 Louis St.
Robinson & Campau, Michigan Trust Bldg.

Howell

Max A. Musch, 122½ W. Grand River St.

Iron Mountain

F. E. Parmelee, 1112 Stockbridge Ave.

Ironwood

N. Albert Nelson, 164 Harding Ave.

Jackson

Kressbach and Frost, 407 S. Jackson St.

Kalamazoo

M. C. J. Billingham, 211 Woodward Ave.
LeRoy & Newlander, Pratt Bldg.
Stewart-Kingscott Co., 208 Elm St.

Lansing

Lee Black & Kenneth C. Black, Capitol Savings & Loan Bldg.
Bowd & Munson, Wilson Bldg.
Warren S. Holmes Co., Olds Tower Bldg.

Leonidas

Randall Wagner

Marquette

John D. Chubb, 412 Nester Block (also in Chicago)

Menominee

Derrick Hubert, Sheridan Rd.

Mullett Lake

G. Harold Thompson, Box 14

Plymouth

George J. Haas, 243 N. Main St.

Port Huron

Walter H. Wyeth, Peoples Bank Bldg.

Royal Oak

Frederick D. Madison Inc., 258 Washington Sq. Bldg.
Worden & Price, 269 Washington Sq. Bldg.

Saginaw

Samuel C. Allen, Eddy Bldg.
Frederick Beckbissinger, 304 Carroll St.
Donald A. Kimball, Eddy Bldg.

St. Johns

R. V. Gay
St. Clair Pardee

Traverse City

Ralph L. Bauer, State Bank Bldg.

Minnesota

Duluth

E. F. Broomhall, 2732 London Rd.
Erickson & Co., Alworth Bldg.
Giliuson & Ellingsen, Torrey Bldg.
Melander & Lightner, Phoenix Bldg.
P. M. Olsen, Sellwood Bldg.
Charles S. Olson, 119 W. 5th St.
Thomas J. Shefchik, Glencoe Bldg.
C. H. Smith, Torrey Bldg.

Fergus Falls

Broaten & Foss Co., Orpheum Theatre Bldg.

Hibbing

J. C. Taylor, 313½ Howard St.

Mankato

Pass & Rockey, 124½ E. Jackson St.
Ernest H. Schmidt, Coughlan Bldg.

Minneapolis

E. B. Croft, 1004 Marquette Ave.
Haxby & Bissell, 1111 Nicolet Ave.
Jacobson & Jacobson, Sexton Bldg.
Lang & Raugland, Essex Bldg.
Larson & McLaren, Roanoke Bldg.
Charles F. Leighton, Roanoke Bldg.
Long & Thorshov, Inc., Andrus Bldg.
Pesek & Shifflet, 914 Marquette Ave.
Sund & Dunham, Essex Bldg.
Wessel, Brunet & Kline, 805 LaSalle Ave.

New Ulm

Albert G. Plagens, 300 N. State St.

St. Cloud

Nairne W. Fisher, 513 St. Germain St.
Louis C. Pinault, Granite Exchange Bldg.

St. Paul

William L. Alban, Endicott Bldg.
P. C. Bettenburg, Inc., 1437 Marshall Ave.
Carl H. Beutow, 306 N. Snelling Ave.
Eugene D. Corwin, Guardian Bldg.
Ellerbe & Co., Minnesota Bldg.
Frenzel & Kronick, 2694 University Ave.
Ray R. Gauger & Co., New York Bldg.
William M. Ingemann, Globe Bldg.
Clarence H. Johnston, Empire Bank Bldg.
Eugene V. Schaefer, Shubert Bldg.
Slifer & Cone, Endicott Bldg.
Toltz, King & Day, Inc., Pioneer Bldg.

Thief River Falls

Henry C. Eckland & Co.

Winona

Boyum, Schubert & Sorensen, 117 W. 3rd St.

Mississippi

Greenwood

Robert J. Moor, Box 507

Gulfport

Shaw & Wolcben, Durham Bldg.
Shourds & Bean, Hewes-Martin Bldg.
Vinson B. Smith, Jr., Hewes Bldg.

Hattiesburg

E. C. Hearon & Sons, Carter Bldg.
Landry & Lockett (also in New Orleans, La.)

Jackson

Frank P. Gates Co., Millsaps Bldg.
Hull & Drummond, Old Merchants Bank Bldg.
E. L. Malvaney, Millsaps Bldg.
R. W. Naef, Millsaps Bldg.
N. W. Overstreet & Town, Standard Life Bldg.
James M. Spain, Merchants Bank Bldg.

McComb

J. Howard Ryan

Meridian

Krouse & Brasfield, Kidder Bldg.
R. C. Springer, Rosenbaum Bldg.

Picayune

Wilfred S. Lockyer, Box 217

Starkville

Stevens & Johnston

Vicksburg
Wm. A. Stanton, 1220 Finney St.

Missouri

Chillicothe
R. Warren Roberts

Jefferson City
John M. Schaper, Central Trust Bldg.

Kansas City
Samuel W. Bihr, Jr., 1002 Walnut St.
Ernest O. Brostrom, 3725 Valentine Rd.
Carroll & Dean, R. A. Long Bldg.
Felt, Dunham & Kriehn, 4638 Mill Creek Blvd.
Edward M. Fuller, 1012 Baltimore Ave.
Greenebaum, Hardy & Schumacher, 410 Scarritt Arcade
Frederick C. Gunn, National Fidelity Life Bldg.
Keene & Simpson, 5 W. 10th St.
H. D. Pampel, Finance Bldg.,
Sayler & Owen, 1207 Grand Ave.
Chas. A. Smith, 1009 Baltimore Ave.
Wight & Wight, First National Bank Bldg.

Moberly
Ludwig Abt

St. Joseph
Eckel & Aldrich, Corby Bldg.
Eugene R. Meier, Bartlett Bldg.

St. Louis
George Barnett, Syndicate Trust Bldg.
Bonsack & Pearce, Inc., 411 Olive St.
Marcel Boulicault, Ambassador Bldg.
Austin E. Fitch, Washington University School of Architecture
Ernest T. Friton, Security Bldg.
Henry P. Hess, 411 N. 7th St.
Hoener, Baum & Froese, Grand Blvd. at Laclede St.
Wm. B. Ittner, Inc., 911 Locust St.
Jamieson & Spearl, Arcade Bldg.
Johnson & Maack, Chemical Bldg.
F. A. Ludewig Co., 3957 Tholozan St.
J. Hal Lynch & Son, Clayton
O'Meara, Hills & G. E. Quick Associate, 5709 Waterman Blvd.
O. W. Stiegemeyer, 4412 Lindell Blvd.
Study & Farrar, Arcade Bldg.
Wilbur T. Trueblood & John C. Stephens, Chemical Bldg.
Arthur J. Widmer & Associates, Inc., Arcade Bldg.

Springfield
Earl Hawkins, McDaniel Bldg.
Heckenlively & Mark, Landers Bldg.
Dan R. Sandford, 1362 Benton Ave.

Montana

Billings
Chandler C. Cohagen, Hedden Bldg.
J. G. Link & Co., Electric Bldg.
Edwin G. Osness, 11 Alderson Ave.
William H. Reid, Jr., 1140 N. 30th St.

Bozeman
Fred F. Willson, Box 497

Great Falls
Cottier & Herrington, First National Bank Bldg.
A. V. McIver, Strain Bldg.
George H. Shanley, First National Bank Bldg.
J. van Teylingen, Medical Arts Bldg.

Havre
Frank F. Bossout, 133 4th Ave.

Helena
Hugenin & De Kay, 440 N. Benton Ave.

Kalispell
Fred A. Brinkman, Whipps Block

Missoula
H. E. Kirkemo, Lehsou Block

Nebraska

Beatrice
R. W. Grant, 109½ N. 5th St.

Fremont
George Grabe, 304 E. 6th St.

Grand Island
Gordon Shattuck, Clinic Bldg.

Hastings
Marcus L. Evans, Cameron Bldg.
K. H. Gedney Co., 2nd & Kansas Ave.

Kearney
J. P. Helleberg, 10 N. 23rd St.
McClure & Walker, 2111½ Central Ave.

Lincoln
Davis & Wilson, 525 S. 13th St.
Meginnis & Schaumberg, Federal Security Bldg.
J. F. Reynolds, 1637 S. 11th St.

Norfolk
James C. Stitt, Norfolk National Bank

North Platte
C. C. Coursey, Neville Bldg.

Omaha
N. R. Brigham, 5404 Western Ave.
Everett S. Dodds & Son, 5011 N. 22nd St.
Lahr & Stangel, W. O. W. Bldg.
John Latenser & Sons, Inc., Saunders-Kennedy Bldg.
John & Alan McDonald, Standard Oil Bldg.
Charles W. Steinbaugh, Brandeis Theater Bldg.

Scottsbluff
E. L. Goldsmith & Co., Weller Bldg.

Nevada

Las Vegas
A. L. Worswick, 115 S. 4th St. (also in San Bernardino, Calif.)

Reno
F. J. DeLongchamps, Inc., Gazette Bldg.
Geo. A. Ferris, Box 1949

New Hampshire

Dover
J. Edward Richardson, 56 Grove St.

Durham
Huddleston & Hersey, Town Hall Bldg.

Hanover
Jens Fredrick Larson, 27 E. Wheelock St.
Wells, Hudson & Granger, Main St.

Laconia
Norman P. Randlett, 614 Main St.

New Jersey

Camden
Byron H. Edwards, 130 N. Broadway
Joseph Norman Hettel, 720 Federal St.
F. Herbert Radey, 101 N. 7th St.

Elizabeth
Leslie M. Dennis, 333 N. Broad St.
Robert C. Edwards, 6 Hillside Rd.
C. Godfrey Poggi, 275 Morris Ave.
Lauren V. Pohlman, 80 Broad St.

Englewood
Lawrence C. Licht, 101 W. Palisade Ave.

Fort Lee
Hacker & Hacker, Fort Lee Trust Bldg. (also in New York City)

Irvington
Office of Victor H. Strombach, 1243 Springfield Ave.

Jersey City
Hugh A. Kelly, 921 Bergen Ave.
William Neumann & Sons, 587 Summit Ave.

Morristown
Walter Slifer, 10 Park Pl.
Oscar B. Smith, 59 Franklin St.
Campbell Voorhees, Schuyler Pl.

Newark
Charles F. Ackerman, 45 Clinton St.
J. Frederick Cook, 9 Clinton St.
Frank Grad & Son, 48 Commerce St.
Guilbert & Betelle, Chamber of Commerce Bldg.

New Brunswick
Alexander Merchant & Son, 1 Elm Row

Passaic
Kelly & Struyk, 157 Prospect St.

Paterson
Fanning & Shaw, 49 Ward St.
Lee & Hewitt, 152 Market St.
John C. Van Vlandren, 7 Smith St.
Wentworth & Vreeland, 140 Market St.

Plainfield
Ernest T. Brown, 201 E. 5th St.

Princeton
Rolf William Bauhan, 90 Nassau St.

Red Bank
Vincent J. Eck, Zobel Bldg.

Summit
William A. Pieper, Commercial Bldg.

Teaneck
John H. Liebau, 191 Larch Ave.
B. Francis McGuire, 705 Linden Ave.

Trenton
Harry A. Hill, Broad Street Bank Bldg.
Herman L. Mack, 2428 Liberty St.

Union Township
Frederick A. Elsasser, 1000 Stuyvesant Ave.

Upper Montclair
Francis A. Nelson, 303 Highland Ave.

West New York
William Mayer, Jr., 711 Bergenline Ave.
Frank J. Ricker, 683 Hudson Ave.

Woodbridge
Vincent J. Miller, 12 Crampton Ave.

New Mexico

Albuquerque
Brittelle & Ginner, K. of P. Bldg.
Louis G. Hesselden, 403 N. 12th St.

Carlsbad
W. L. McAtee & Co., Box 889

Clovis
Robert E. Merrell

Las Vegas
Chas. W. Barrett

Roswell
C. R. Carr & Co., 204½ N. Main St.

Santa Fe
John Gau Meem, Box 628
Gordon F. Street, 127 E. Water St.

New York

Albany
Andrew L. Delehanty, 123 N. Pearl St.
H. O. Fullerton, 152 Washington Ave.
James A. Galvin, 11 N. Pearl St.
Thomas L. Gleason, 522 Warren St.
Galen H. Nichols, 93 State St.
Pember & Demers, 24 James St.
Marcus T. Reynolds, 100 State St.
J. Russell White, 109 State St.

Amsterdam
Howard F. Daly, 15 E. Main St.

Auburn
Wallace P. Beardsley, Seward Block

Binghamton
Conrad & Cummings, 99 Collier St.
L. J. Kaley, O'Neil Bldg.

A. T. Lacey & Sons, 52 Exchange St.
Walter H. Whitlock, 609 Chenango St.

Brooklyn

Walter C. Martin, Supt. of School Bldgs., New York City, Flatbush Ave. Extension & Concord St.
Henry V. Murphy, 1 Hanson Pl.

Buffalo

Frederick C. Backus, 360 Delaware Ave.
Bley & Lyman, 505 Delaware Ave.
Green & James, 1 Niagara Square
Harbach & Kideney, 505 Franklin St.
Albert H. Hopkins, Liberty Bank Bldg.
F. J. & W. A. Kidd, 524 Franklin St.
Daniel G. McNeil, 27 Groveland St.
Charles E. Mott, 360 Delaware Ave.
Roswell E. Pfohl, 204 W. Huron St.
Carl Schmill & Son, Prudential Bldg.

Centerport

James Van Alst

Cortland

Carl W. Clark (also in New York City)

Elmira

Robert T. Bickford, 215 W. Water St.

Gloversville

W. Brown Van Dreser, 31 W. Fulton St.

Harrison

Robert P. Vignola, 231 Harrison Ave.

Hempstead

Edward Hahn, 62 Washington St.
McCullough & Johnke, 250 Fulton Ave.

Herkimer

R. E. Sluyter, First National Bank Bldg.

Hewlett

Lawrence J. Lincoln, 1185 Franklin Ave.

Ithaca

Arthur N. Gibb, 302 E. State St.

Jamaica

W. H. Spaulding, 163 Jamaica Ave.

Jamestown

Beck & Tinkham, Bailey Bldg.
Raymond A. Freeburg, 1105 W. 3rd St.
Oliver R. Johnson, Fenton Bldg.

Kingston

Gerard W. Betz, 286 Wall St.

Middletown

Robert R. Graham, 25 Prospect St.
E. P. Valkenburgh, 7 Linden Ave.

Newburgh

Gordon S. Marvel, 56 2nd St.

New York

Frederick L. Ackerman, 25 W. 44th St.
Adams & Prentice, 15 W. 38th St.
William Adams, 15 W. 38th St.
Wesley Sherwood Bessell, 16 E. 52nd St.
Bloch & Hesse, 18 E. 41st St.
George A. Boehm, 2 W. 45th St.
Clarence Wilson Brazer, 40 E. 42nd St. (also in Chester, Pa.)
Walter B. Chambers, 369 Lexington Ave.
Elliott L. Chisling, 420 Madison Ave.
Coffin & Coffin, 125 E. 46th St.
Delano & Aldrich, 126 E. 38th St.
Division of Architecture, 80 Centre St.
William F. Dominick, 522 5th Ave.
Aymar Embury II, 150 E. 61st St.
Randolph Evans, 140 Nassau St.
Wm. Gehron, 101 Park Ave.
Archibald F. Gilbert, 358 5th Ave.
Alfred Morton Githens, 101 Park Ave.
Goodwillie & Moran, 366 W. 126th St.
W. K. Harrison & J. A. Fouilhoux, 30 Rockefeller Plaza
Thomas H. Irving, 15 Park Row
Louis F. Jallade, 597 5th Ave.
Knappe & Morris, 192 Lexington Ave.
Archibald G. Lamont, 156 5th Ave.
Joseph M. Lawlor, 317 W. 90th St.
William Lescaze, 211 E. 48th St.
John M. Liptak, 36 W. 44th St.
Lowinson & Todaro, 29 W. 26th St.
William Orr Ludlow, 101 Park Ave.
W. Philip McGovern, 156 E. 42nd St.
McKim, Mead & White, 101 Park Ave.
Frederick Mathesius, 101 Park Ave.
Mayers, Murray & Phillip, 2 W. 47th St.
Merrill, Humble & Taylor, 23 E. 26th St.
Charles B. Meyers, 31 Union Sq., W.
Frank J. and Sylvester W. A. Murphy, 280 W. 246th St.
Polhemus & Coffin, 232 Madison Ave.
John Russell Pope, 542 5th Ave.
George B. Post & Sons, 101 Park Ave.
Wilson Potter, 22 E. 17th St.
Robert J. Reiley, 62 W. 45th St.
James Gamble Rogers, Inc., 156 E. 46th St.
Rossiter & Muller, 22 E. 40th St.
Walter S. Schneider, 101 Park Ave.
Edward I. Shire, 373 4th Ave.
Shreve, Lamb & Harmon, 11 E. 44th St.
Smith & Ward, 100 E. 42nd St.
Starrett & Van Vleck, 267 5th Ave.
Stoughton & Stoughton, 156 E. 42nd St.
Thompson, Holmes & Converse, 101 Park Ave.
Tooker & Marsh, 101 Park Ave.
Hobart B. Upjohn, Grand Central Terminal
T. Visscher & J. Burley, 51 E. 42nd St.
F. B. & A. Ware, 1170 Broadway
Harold H. Werner, 489 5th Ave.
Edgar I. Williams, 128 E. 38th St.
York & Sawyer, 100 E. 42nd St.

Niagara Falls

Chas. F. Obenhack, Gluck Bldg.
Chester R. Phelps, Gluck Bldg.

Plattsburg

Alvin W. Inman, 71 Clinton St.

Port Jefferson

Daniel Perry, Main St.

Poughkeepsie

William Henry Jones, 2 Cannon St.
Edward C. Smith, 39 Market St.

Richfield Springs

Myron A. Jordan, Main St.

Riverdale-on-Hudson, New York City

Dwight James Baum, W. 244th St. & Waldo Ave.

Rochester

Carl C. Ade, 52 James St.
Lewis J. Brew, 42 East Ave.
Charles A. Carpenter, Genesee Valley Trust Bldg.
Dryer & Dryer, 2550 East Ave.
Gordon & Kaelber, 311 Alexander St.
George F. Lorenz, 3086 St. Paul Blvd.
Francis R. Scherer, 13 S. Fitzhugh St.
Smith & Stickney, 154 East Ave.

Rockville Center

Walter D. Spelman, 219 Lakeview Ave.

Southampton

Wm. I. LaFon, Jr., 48 Main St.

Syracuse

Paul Hueber, Syracuse Bldg.
Melvin L. & Harry A. King, Denison Bldg.
Randall & Vedder, Sedwick, Andrews & Kennedy Bldg.
D. Kenneth Sargent, Syracuse Bldg.
Wright & Ellis, City Bank Bldg.

Troy

Charles F. Egan, 251 River St.

Utica

Bagg & Newkirk, 258 Genesee St.
Edward J. Berg, Berg Bldg.
Kinne & Frank, 7 Hopper St.

Watertown

Office of D. D. Kieff, C. of C. Bldg.
Lansing & Greene, Northern New York Trust Bldg.

Westport

Quentin F. Haig

Wyandanch

Hugo H. Avolin, Belmont Ave.

Wyoming

Bryant Fleming

North Carolina

Asheville

Ronald Greene, Ltd., Arcade Bldg.
Lindsey M. Gudger, 52 Carter St.

Charlotte

Louis H. Asbury, Inc., Commercial Bank Bldg.
Chas. C. and Walter W. Hook, Commercial Bank Bldg.
M. R. Marsh, Builders Bldg.
Willard G. Rogers, 103 S. Tryon St.

Durham

Atwood & Weeks, Inc., Southern Fire Bldg.
George Watts Carr

Elkin

J. M. Franklin, Box 95

Gastonia

Hugh E. White, 207 W. 4th Ave.

Greensboro

Harry Barton, Jefferson Standard Bldg.
W. L. Brewer, 225½ S. Elm St.
C. C. Hartmann
Jos. J. Sawyer

Henderson

Eric G. Flannagan, 215 Young Ave.

Hendersonville

Erle G. Stillwell, Box 1056

Hickory

Robt. L. Clemmer, Grant Bldg.
Q. E. Herman, 1234 13th Ave.

High Point

Eccles D. Everhart, 114½ W. Washington St.

Leaksville

James W. Hopper, 234 W. Washington St.

Louisburg

M. Stuart Davis

Monroe

I. J. Tucker, Box 60

Raleigh

Wm. Henley Deitrick, 102 W. Hargett St.

Shelby

V. W. Breeze, Box 325

Wilmington

Leslie N. Boney, 221 S. 5th St.

Winston Salem

Hall Crews, 645 Holly Ave.
Harold Macklin, Reynolds Bldg.
Northup & O'Brien, Reynolds Bldg.
William Roy Wallace, Reynolds Bldg.

North Dakota

Bismarck

Hess & Deeter, Eltinge Bldg.
Ritterbush Bros., 209 N. 7th St.

Devils Lake

John Marshall, 205 5th St.

Fargo

Braseth & Houkom, Black Bldg.
William F. Kurke, 1117 13th Ave., N.
Joseph E. Rosatti, 117 Broadway

Grand Forks

Joseph Bell DeRemer, 1610 Veits Ave.
Theodore B. Wells, 1006 Chestnut St.

Jamestown

Gilbert R. Horton, City Hall Bldg.

Minot

G. H. Bugenhagen
E. W. Molander, First Avenue Bldg.

Ohio

Akron

M. M. Konarski, Board of Education
Kraus & Helmkamp, 275 W. Market St.
Lauer & Huff, 31 N. Summit St.

Bowling Green
S. P. Stewart & Son, W. Wooster St.

Bucyrus
William Unger, Box 545

Canton
Office of Charles E. Firestone, 1342 Cleveland Ave., N.

Cincinnati
Charles Frederick Cellarius, St. Paul Bldg.
Gustave W. Drach, Inc., Union Trust Bldg.
Fred W. Garber, 616 Walnut St.
Garriott & Becker, 800 Broadway
Grunkemeyer & Sullivan, 3717 Eastern Ave.
Samuel Hannaford & Sons, Dixie Terminal Bldg.
Hunt & Allan, Eagle Savings Bldg.
E. C. & G. T. Landberg, 114 Garfield Pl.
Matthews & Denison, 514 Main St.
J. A. Nardini, St. Paul Bldg.
Potter, Tyler & Martin, 35 E. 7th St.
Edward J. Schulte, 920 E. McMillan St.
John F. Sheblessy, 1202 Republic St.
Tietig & Lee, 34 W. 6th St.

Cleveland
Walter G. Caldwell, Engineers Bldg.
Junior W. Everhard, 9219 Clifton Blvd.
Fox & Duthie, Union Trust Bldg.
Harry A. Fulton, 5716 Euclid Ave.
Garfield, Harris, Robinson & Schafer, National City Bldg.
Hubbell & Benes, 4500 Euclid Ave.
Walter R. McCornack, 10006 Carnegie Ave.
Small, Smith & Reeb, Terminal Tower
Warner & Mitchell, Bulkley Bldg.
Jos. L. Weinberg, 1836 Euclid Ave.

Columbus
John Quincy Adams, 53 Lexington Ave.
F. F. Glass, 20 S. 3rd St.
Harsh & Davies, 145 N. High St.
Edward Kromer, Board of Education, 270 E. State St.
Richards, McCarty & Bulford, 584 E. Broad St.
Ronan & Ingleson, 299 S. Front St.
F. S. Rusk & C. W. Youst, 35 E. Main St.
John P. Schooly, State Office Bldg.
Howard Dwight Smith, 203 E. Broad St.
Samuel F. Swales, 142 E. Northwood Ave.

Dayton
Rollin E. Gebhart, Miami Savings Bldg.
Pretzinger & Pretzinger, Reibold Bldg.
Schenck & Williams, Third National Bldg.
Walker, Norwick & Templin, American Bldg.

East Cleveland
William Koehl, 1816 Wellesley St.

East Liverpool
H. Allan Todd, 511 College St.

Elyria
R. S. Silsbee & A. C. Smith

Forest
W. W. Burk

Fort Laramie
F. E. Freytag, Box 144

Fremont
C. H. Shively, Kinney Bldg.

Grand Rapids
W. Howard Manor, Main St.

Hamilton
George W. Barkman, 20 N. Sixth St.
Frederick G. Mueller & Walter R. Hair, Hotel Hamilton

Hillsboro
Henry R. Ervin, 114 N. High St.

Lima
Thomas D. McLaughlin & Associates, Dominion Bldg.

Mansfield
Harry J. Brumenshenkel, Walpark Bldg.
Vernon Redding & Associates, Walpark Bldg.

Middletown
Harold W. Goetz, 1000 Central Ave.

Mt. Vernon
J. E. Lewis, 108 S. Main St.

Nelsonville
William Mills & Son, 241 Washington St.

New Philadelphia
Charles J. Marr, 151 N. Broadway
J. Davis Wilson, 118 Fair Ave., N. W.

Norwalk
Granville E. Scott, Citizens Bank Bldg.

Portsmouth
DeVoss & Donaldson, 1st National Bank Bldg.

Steubenville
Fred H. Clarke, National Exchange Bank Bldg.

Toledo
Britsch & Munger, Nicholas Bldg.
Edwin M. Gee, Board of Education
Stephen M. Jokel, 320 Ontario St.
Mills, Rhines, Bellman & Nordhoff, Inc., 718 Jefferson Ave.
Stophlet & Stophlet, Security Bank Bldg.

Warren
Roy T. Campbell, Electric Block, High St.
Keich & O'Brien, Union Bank Bldg.

Youngstown
Paul Boucherle & Myron N. Goodwin, Union National Bank Bldg.
M. Gilbert Miller, 12 W. Madison Ave.
Charles F. Owsley, 211 N. Champion St.
Richard A. Zenk, 144 W. Wood St.

Oklahoma

Ada
Albert S. Ross, Cummings Bldg.

Altus
Aubrey C. Chisum

Ardmore
J. B. White & Sons, 902 B. St., N. W.

Chickasha
Paul Harris, Oklahoma National Bank Bldg.

Enid
Blumenauer & Associates, Stephenson Bldg.
R. W. Shaw, Bass Bldg.

Muskogee
L. L. Howenstine, 2705 Oklahoma Ave.
H. H. Niemann, 1155 Summit St.

Norman
Harold Gimeno, 820 Elm Ave.
Joe E. Smay, University of Oklahoma

Oklahoma City
Leonard H. Bailey, Colcord Bldg.
Dennis Donovan & Robt. Ferguson, 101 E. 3rd St.
C. F. Drury, 908 Perrine St.
Hicks & Moore, Cotton Exchange Bldg.
Layton, Hicks & Forsyth, Braniff Bldg.
J. O. Parr, Hales Bldg.
Sorey, Hill & Sorey, First National Bldg.
Tonini & Bramblet, Cotton Exchange Bldg.
Walter T. Vahlberg, 1222 N. Broadway Pl.
Winkler & Reid, Oklahoma Savings Bldg.

Ponca City
G. J. Cannon, Community Bldg.

Shawnee
Hugh W. Brown, Jr., Petroleum Bldg.
A. C. Davis & Sons, 412 N. Broadway

Stillwater
Philip A. Wilber, 315 Knoblock St.

Tulsa
A. M. Atkinson, Thompson Bldg.
John Duncan Forsyth, 115 E. 18th St.
A. J. Love & Co., 748 S. Phoenix St.
Donald B. McCormick, 1238 S. Boston Ave.
Leon B. Senter, Philtower Bldg.
L. Shumway, Alexander Bldg.

Oregon

Astoria
J. E. Wicks

Baker
Wallace Landreth, Baker Loan & Trust Bldg.

Eugene
Graham B. Smith, Willamette St.

Klamath Falls
Howard R. Perrin, Underwood Bldg.

Medford
William Laing, U. S. National Bank Bldg.

Portland
Barrett & Logan, 302 N. Broadway
John V. Bennes, Lewis Bldg.
L. L. Dougan, 1326 Columbia St.
A. E. Doyle & Associates, Pacific Bldg.
C. N. Freeman, Concord Bldg.
Francis B. Jacobberger, McKay Bldg.
Johnson, Wallwork & Dukehart, U. S. Bank Bldg.
Jones and Marsh, Woodlark Bldg.
Knighton & Howell, U. S. National Bank Bldg.
Lawrence, Holford & Allyn, Failing Bldg.
Roald & Schneider, Spalding Bldg.
F. Marion Stokes, Terminal Sales Bldg.
Lee Thomas, Inc., Weatherly Bldg.
Tourtellotte & Phillips, Postal Bldg.
Whitehouse & Church, Railway Exchange Bldg.

Salem
Lyle P. Bartholemew, U. S. National Bank Bldg.
Frank H. Struble, 381 State St.

Pennsylvania

Allentown
Jacoby & Everett, Commonwealth Bldg.
Ruhe & Lange, 12 N. 6th St.

Altoona
Hunter & Caldwell, 3601 5th Ave.
D. G. Puderbaugh, 1123 17th Ave.

Ardmore
Henry L. Reinhold, Jr., 127 Coulter Ave.

Bethlehem
Lovelace & Spillman, 103 W. Broad St.

Bradford
Thomas K. Hendryx, Box 213

Canonsburg
George W. Brugger, First National Bank Bldg.

Carlisle
Bobb & Bixler, 82 E. Ridge St.

Charleroi
J. C. Brenton, First National Bank Bldg.

Chester
Clarence Wilson Brazer, 421 Market St. (also in New York)

Columbia
Granville E. Paules, 554 Chestnut St.

Donora
Conrad C. Compton, 4th St. and Thompson Ave.

Du Bois
Russell G. Howard, Deposit Bank Bldg.

Ellwood City
B. J. McCandless, 239 4th St.

Erie
Geo. E. Eichenlaub
Fred A. Fuller, Commerce Bldg.

J. Howard Hicks, 124 W. 7th St.
Clement S. Kirby, Commerce Bldg.
G. W. Stickle, Commerce Bldg.

Esterly
Elmer H. Adams

Greensburg
C. H. Sorber, First National Bank Bldg.

Harrisburg
C. D. Hasness, 222 Market St.
Kast & Kelker, 222 Market St.
Lawrie & Green, 3rd & Forster Sts.
B. E. Starr, 7 S. 2nd St.
Joseph Lesher Steele, 23 N. 3rd St.

Hazleton
Harry B. Lentz, Traders Bank

Homestead
Adam G. Wickersham, 135 E. 8th Ave.

Indiana
Fred P. Sprankle, 366 N. 9th St.

Irwin
Robert J. Brocker, Box 72

Jenkintown
Berninger & Bower, 304 York Rd.

Johnstown
Horace A. Bailey, Fisher Bldg.
H. B. Raffensperger, Johnstown Trust Bldg.
H. M. Rogers, Johnstown Bank & Trust Bldg.

Kittanning
Tillman Scheeren, Jr., Boarts Bldg.

Lake Ariel
Floyd A. Chapman

Lancaster
Henry Y. Shaub, 20½ N. Queen St.
C. Emlen Urban, Woolworth Bldg.

Lebanon
Harvey T. Hauer, 815 Cumberland St.

Lewisburg
Malcolm A. Clinger, 33 N. 2nd St.

Monessen
H. Ernest Clark, 725 2nd St.

Mount Joy
John W. Greiner, 31 New Haven St.

Moylan
William McKee Walton, Box 163

New Castle
W. G. Eckles Co., Lawrence Savings & Trust Bldg.
The Thayer Co., Greer Bldg.

Norristown
Crawford & Friend, Main & Swede Sts.

Oil City
Emmett E. Bailey, 111 Center St.
Holmes Crosby, Beers Bldg.

Overbrook Hills
Ralph E. White, 1507 Cliff Rd.

Philadelphia
W. Pope Barney & Roy W. Banwell, 1805 Walnut St.
Wesley Lesher Blithe, 1524 Chestnut St.
Arthur H. Brockie, Architects Bldg.
Horace W. Castor, Architects Bldg.
Irwin T. Catharine, Parkway at 21st St.
Paul P. Cret, Architects Bldg.
Henry D. Dagit & Sons, 1329 Race St.
Davis & Dunlap, 1805 Walnut St.
Folsom & Stanton, Architects Bldg.
Gondos & Gondos, Architects Bldg.
Francis A. Gugert, Architects Bldg.
Heacock & Hokanson-C. A. Scheuringer, 1211 Chestnut St.
Virgil L. Johnson, 21st & Parkway
Karcher & Smith, 1520 Locust St.
Charles Z. Klauder, 1429 Walnut St.
W. H. Lee, 1505 Race St.
MacKenzie & Blew, Otis Bldg.
Mellor & Meigs, 205 S. Juniper St.
Paul Monaghan, 1520 Locust St.
Emile G. Perrot, 1405 N. 16th St.
Savery & Scheetz, 21 S. 12th St.
Howell L. Shay, Packard Bldg.
Harry Sternfeld, Architects Bldg.
Horace Trumbauer, Land Title Bldg.
Simon Wassermann, 136 S. 4th St.
Frank R. Watson, Edkins & Thompson, Architects Bldg.
Wenner & Fink, 1701 Arch St.

Pittsburgh
W. M. Braziell, 323 4th Ave.
Carlisle & Sharrer, Martin Bldg.
R. C. and M. C. Celli, Century Bldg.
Press C. Dowler, Century Bldg.
Joseph Hoover, Starr Bldg.
J. Lawrence Hopp, 508 3rd Ave.
Ingham & Boyd, Empire Bldg.
Kaiser, Neal & Reid, 324 4th Ave.
Edward B. Lee, Chamber of Commerce Bldg.
Albert George Lowe, Commonwealth Building Annex
Raymond M. Marlier, Empire Bldg.
William Richard Perry, 2882 W. Liberty Ave.
John H. Phillips, Wabash Bldg.
Prack & Prack, 119 Federal St.
Thomas Pringle, 217 9th St.
Schwab & Palmgreen, Koppers Bldg.
James T. Steen & Sons, 323 4th Ave.
A. N. Steinmark, Empire Bldg.
Edward Stotz, Bessemer Bldg.
Robert Maurice Trimble, Commonwealth Building Annex
Harry Viehman, Chamber of Commerce Bldg.
Eric Fisher Wood & Co., 5260 Center Ave.

Pottstown
Arthur S. Kepner, 121 N. Hanover St.

Pottsville
D. H. Grootenboer-Philip G. Knobloch, 1811 W. Market St.

Reading
William H. Dechant & Sons, 632 Washington St.
H. I. Eiler, 147 N. 5th St.
G. C. Freeman, 419 Carsonia Ave.
W. Marshall Hughes, 147 N. 5th St.
Muhlenberg, Yerkes & Muhlenberg, 5th & Walnut Sts.
Scholl & Richardson, 110 S. 10th St.
Calvin J. Young, Pres., Associated Registered Architects, 226 N. 6th St.

Sayre
Harry C. Child, 501 S. Keystone Ave.

Scranton
Lester Merritt Davis, Rehrig Bldg.
Davis & Lewis, Scranton Electric Bldg.
Hancock & Willson, Mears Bldg.
Edward J. Rutledge, 148 Adams Ave.
W. Monroe Whitney, 511½ Brooks Bldg.

Sharon
Clepper & Clepper, 72 Vine Ave.

State College
Kapp & Kennedy, Glennland Bldg.

Stroudsburg
Harold T. Rinker & Murrel R. Kiefer, 7th & Main Sts.

Sunbury
Davis & Rice, Sunbury Trust Bldg.

Telford
Charles M. Talley, 314 W. Broad St.

Uniontown
H. W. Altman, Fayette Title & Trust Bldg.
Emil R. Johnson, 24 Robinson St.

Washington
S. Lloyd Beall, Washington Trust Bldg.
C. Garey Dickson, Court Square Arcade

Wilkes-Barre
Thos. A. Foster, Brooks Bldg.
R. M. Herr, 140 S. Main St.
Innes & Levy, 176 S. Main St.
Mack & Sahm, 22 N. Franklin St.
Austin L. Reilly, Bennett Bldg.
Stanley K. Walborn-J. S. Pettebone, Assoc., Second National Bank Bldg.

Williamsport
W. D. Schollenberger, 11 W. 4th St.
R. Douglas Steele, 34 W. 4th St.

Wyomissing
Claude B. Mengel, 1122 Penn Ave.

York
F. G. Dempwolf, Cassatt Bldg.
John B. Hamme, 31 W. Market St.
Robert A. Stair, 100 E. Market St.

Rhode Island

Pawtucket
Albert H. Humes, 332 Main St.
Monahan & Meikle, 255 Main St.

Providence
Edward O. Ekman, 72 Weybosset St.
Irving S. Gorman, City Hall
Albert Harkness, Industrial Trust Bldg.
Joseph A. Hickey, 45 Oldham St.
Howe & Church, Turks Head Bldg.
Jackson, Robertson & Adams, Turks Head Bldg.
William R. Walker & Son, 49 Weybosset St.

South Carolina

Anderson
Sam M. Cathcart, Box 73
Charles Wm. Fant, 109½ Sharpe St.

Bennettsville
H. D. Harrall, 717 W. Main St.

Charleston
Simons & Lapham, 42 Broad St.

Clemson
Rudolph E. Lee

Columbia
Lafaye & Lafaye, 1226 Sumter St.
J. B. Urquhart, Union Central Bldg.
Wessinger & Stork, Arcade Bldg.

Florence
W. D. Harper
Hopkins & Baker, Florence Trust Bldg.

Greenville
J. G. Cunningham, 100 E. Washington St.
J. E. Sirrine & Co.

Lancaster
Julian S. Starr, Box 143

Prosperity
Heyward S. Singley

Sumter
J. Whitney Cunningham, Pierson Bldg.

South Dakota

Huron
F. C. W. Kuehn, Farmers & Merchants Bank

Mitchell
Walter J. Dixon, Woelfel Bldg.
Floyd F. Kings, Western Bldg.

Rapid City
James C. Ewing, 609½ Main St.

Sioux Falls
Hugill & Blatherwick, Boyce Greeley Bldg.
Perkins & McWayne, Paulton Bldg.
Harold Spitznagel, Western Surety Bldg.

Tennessee

Bristol
R. V. Arnold, 602 Shelby St.

Chattanooga
Crutchfield & Law
Selman T. Franklin, 806 Cherry St.
Wilson A. Gosnell, Volunteer Bldg.
Clarence T. Jones, 210 Glenwood Dr.
W. H. Sears & P. B. Shepherd, James Bldg.
Gordon L. Smith, Volunteer Bldg.

Johnson City
D. R. Beeson, Sells Bldg.
Leland K. Cardwell

Kingsport
Allen N. Dryden, Improvement Bldg.

Knoxville
Frank O. Barber, 722½ Market St.
Barber & McMurry, 517½ W. Church Ave.
Baumann & Baumann, 813½ Market St.
R. F. Graf & Sons, Journal Bldg.
Manley & Young, Medical Arts Bldg.
Clem H. Meyer, 142 Morningside Drive
M. E. Parmelee, 400 W. Church Ave.

Memphis
George Awsumb, 1792 Forrest Ave.
E. L. Harrison, Fidelity Bldg.
W. C. Jones-W. C. Jones, Jr., Shrine Bldg.
Estes W. Mann, Inc., Shrine Bldg.
Walter R. Nelson, 147 S. 3rd St.
Edwin B. Phillips, Exchange Bldg.
Regan & Weller, Commerce Bldg.

Nashville
Asmus & Clark, Nashville Trust Bldg.
C. K. Colley & Son, American Bank Bldg.
Dougherty & Clemmons, 315 7th Ave.
Hart & Russell, Hitchcock Bldg.
Hart, Freeland & Roberts, Independent Life Bldg.
Henry C. Hibbs, American Trust Bldg.
Granbery Jackson, Jr., Vendome Bldg.
McKissack & McKissack, Morris Memorial Bldg.
Marr & Holman, Stahlman Bldg.
Donald W. Southgate, Nashville Trust Bldg.
Tisdale & Pinson, Independent Life Bldg.
George D. Waller, Independent Life Bldg.
Office of Emmons H. Woolwine, American Trust Bldg.

Texas

Abilene
David S. Castle Co., 1082½ N. 1st St.

Alpine
Victor J. Smith, Sul Ross College

Amarillo
Guy A. Carlander, Box 3158
Rittenberry & Carder, Fisk Bldg.
J. Roy Smith, Blackburn Bldg.
Towne & Funk, Johnson Bldg.

Austin
W. E. Ketchum, 209 E. Milton St.
H. F. Kuehne, Littlefield Bldg.
C. H. Page, Box 936
Page & Southerland, New Masonic Bldg.
Robert Leon White, 2200 Guadalupe St.

Beaumont
A. Babin, Perlstein Bldg.
Wallace B. Livesay, San Jacinto Annex
N. E. Wiedemann, American National Bank

Cisco
R. S. Glenn, 1608 Avenue H.

Corpus Christi
Brock & Roberts, Sherman Bldg.
Hamon & Co., Texas State Bank
Nat W. Hardy, Nixon Bldg.

Corsicana
Blanding & Horn, Mays Bldg.

Dallas
Arthur A. Brown, Mercantile Bldg.
Ralph Bryan, Construction Bldg.
DeWitt & Washburn, Praetorian Bldg.
Flint & Broad, Burt Bldg.
T. J. Galbraith, Slaughter Bldg.
C. H. Leinbach, N. Texas Bldg.
Mark Lemmon, Tower Petroleum Bldg.
Walter C. Sharp, Construction Bldg.
Arthur E. Thomas, Construction Bldg.

El Paso
Guy Lewis Frazer, El Paso National Bank Bldg.
Percy McGhee, First National Bank Bldg.
Gilbert C. Satrang, First National Bank Bldg.

Ennis
Hix McCanless, Box 179

Fort Worth
Hubert Hammond Crane, 3719 Camp Bowie Blvd.
J. B. Davies & Co., 1312 Hemphill St.
Preston M. Geren, 806½ Burnett St.
E. L. Harshbarger, Independent School District
C. M. Love & Co., 314 S. Henderson St.
Joseph R. Pelich, Trinity Life Bldg.
W. A. Tackett & Sons, 4212 Preston St.
Elmer G. Withers Architectural Co., Inc., Mid-Continent Bldg.
Clyde H. Woodruff, 1929 Hurley Ave.

Galveston
Ben Milam, 2115 Ave. F

Greenville
Lindsey & Kilmer, Greenville National Bank

Harlingen
Stanley W. Bliss, Myrick Bldg.

Henderson
J. L. Downing, First National Bank

Houston
Campbell & Keller, 6451 Main St.
Lamar Q. Cato, M. & M. Bldg.
J. W. Dehnert, 3908 Main St.
Joseph Finger, Democratic Bldg.
Louis A. Glover, Inc., 3415 Austin St.
Herbert C. Heath, Bankers Mortgage Bldg.
Henry F. Jonas & Tabor, Union National Bank Bldg.
Moore & Lloyd, 2503 Westheimer St.
Joseph W. Northrop, Jr., 3940 Main St.
Stayton Nunn-Milton McGinty, Scanlan Bldg.
Harry D. Payne, 4301 Main St.
R. G. Schneider, M. & M. Bldg.
Henry Aam Stubee, 3908 S. Main St.
John F. Staub, 4301 Main St.
R. D. Steele, Second National Bank
Maurice J. Sullivan, B. P. Briscoe, S. H. Dixon, Jr. & Jos. Finger, Inc., 4301 Main St.
Swenson & Heidbreder, 3940 S. Main St.
Wirtz & Calhoun, 500 Stuart Ave.

Laredo
Guy M. Trout, Box 684

Livingston
Emory S. White

Longview
N. L. Peters, Glover Crim Bldg.

Lubbock
Butler Co., Box 418
S. B. Haynes, Myrick Bldg.
F. A. Kleinschmidt, Texas Technological College
O. R. Walker, Palace Theatre Bldg.

Marshall
Stanley Brown, 213½ N. Wellington St.

Palestine
Theo. S. Maffitt, N. Sycamore St.

Paris
Will H. Lightfoot
Edwin R. Smith, S. E. Cor. Plaza

Port Isabel
Hadley Smith, 1004 Adams St.

Rosenburg
Ernest L. Shult

San Angelo
John G. Becker

San Antonio
Adams & Adams, Insurance Bldg.
Charles T. Aubin, Smith-Young Tower
Ralph H. Cameron, Box 1063
Leo M. J. Dielmann, 145 North St.
Joe M. Gomez, Travis Bldg.
John M. Marriott, Frost Bank Bldg.
Morris, Noonan & Wilson, Builders Exchange Bldg.
Will N. Noonan, Builders Exchange Bldg.
Henry T. Phelps, Hicks Bldg.
Phelps & Dewees, Gunter Bldg.
Harvey P. Smith, National Bank of Commerce Bldg.

Sherman
John Tulloch, M. & P. Bank Bldg.

Tyler
Gregory & Cates, Gary Bldg.
Shirley Simons, Citizens Bank Bldg.

Waco
Walter Cocke, Jr. & Co., 1503 Franklin Ave.
Birch D. Easterwood & Son, Liberty Bldg.
T. Brooks Pearson, 115 N. 12th St.
Harry L. Spicer, Amicable Bldg.

Wichita Falls
Robinson & Janson, Brown Bldg.
Voelcker & Dixon, Inc., 913½ Indiana Ave.

Utah

Logan
Karl C. Schaub

Ogden
Hodgson & McClenahan, Eccles Bldg.
Eber F. Piers, 2726 Harrison Ave.

Provo
Ashworth & Markham, 44 W. 2nd St.
Joseph Nelson, 147 E. Center St.

Salt Lake City
Ashton & Evans, Beneficial Life Bldg.
Cannon & Fetzer, Templeton Bldg.
Lenord C. Neilson, McIntyre Bldg.
Scott & Welch, Dooly Bldg.
Walter E. Ware, Utah Savings & Trust Bldg.

Vermont

Burlington
Frank Lyman Austin, 240 College St.

Virginia

Alexandria
Brown Rolston, 419 Prince St.

Ashland
L. P. Hartsook

Danville
Roger B. Davis, Masonic Bldg.
J. Bryant Heard

Luray
Mims, Speake & Co.

Lynchburg
Pendleton S. Clark, Krise Bldg.
Hinnant & Smith, Peoples Bank Bldg.
S. S. Johnson & R. C. Brannan, Allied Arts Bldg.

Newport News
Williams, Coile & Pipino, Melson Bldg.

Norfolk
Browne & Fitzgibbon, Royster Bldg.
Rudolph, Cooke & Van Leeuwen, Arcade Bldg.

Richmond
Baskervill & Son, Central National Bank Bldg.
Carneal, Johnston & Wright, Electric Bldg.
L. P. Hartsook & Edward F. Sinnott, 112 E. Cary St.
C. W. Huff, Jr., 6th & Franklin Sts.
Lee, Ballou & Van Dervoort Inc., 110 N. 7th St.
Raymond V. Long, State Board of Education
J. Binford Walford, 103 E. Cary St.
Courtenay S. Welton, 105 E. Cary St.
Marcellus E. Wright, 1103 E. Main St.

Roanoke
Eubank & Caldwell, Inc., Boxley Bldg.
Frye & Stone, 110½ W. Church Ave.
Smithey & Boynton, 112 W. Kirk Ave.

University
S. J. Makielski, Barracks Rd.

Washington

Aberdeen
Clarence W. George, Becker Bldg.
Charles A. Haynes, Aberdeen Savings & Loan Bldg.

Bellingham
Leonard W. Bindon, Medical Bldg.
F. Stanley Piper, Herald Bldg.
Wohleb & Stanton, Herald Bldg.

Pullman
Stanley A. Smith, State College of Washington

Seattle
Bebb & Gould, Hoge Bldg.
Graham & Painter, Dexter Horton Bldg.
Grainger & Thomas, Arcade Bldg.
Wm. J. Jones, Medical Arts Bldg.
William Mallis, Lyon Bldg.
Earl W. Morrison, Textile Tower
David J. Myers, Central Bldg.
F. A. Naramore, Central Bldg.
Fred B. Stephen, Smith Tower
Vas. S. Stimson, Vance Bldg.
James M. Taylor, Jr., Arcade Bldg.
Arch N. Torbitt, 615 Bellevue Ave., N.

Spokane
Charles I. Carpenter, Old National Bank Bldg.
G. A. Pehrson, Old National Bank Bldg.
George M. Rasque, Spokane Savings Bank
Whitehouse & Price, Hutton Bldg.

Tacoma
E. J. Bresemann, Perkins Bldg.
Mock & Morrison, Perkins Bldg.
Fred G. Rounds, W. R. Rust Bldg. (also in Pullman)

Vancouver
Donald J. Stewart, 707½ Main St.

Yakima
Linden B. Bissell, Ward Bldg.
Newton C. Gauntt, R. ‡ 6
John W. Maloney, Larson Bldg.

West Virginia

Bluefield
Garry & Sheffey, Bailey Bldg.
Alex B. Mahood, Box 410

Buckhannon
Carl Reger, Box 27

Charleston
H. S. Kyle & J. N. Arnold, Union Trust Bldg.
Meanor & Handloser, Payne Bldg.
Warne-Tucker-Silling, Masonic Temple

Clarksburg
E. C. Holmboe, Empire Bldg.
Edward J. Wood & Son

Fairmont
L. D. Schmidt, Professional Bldg.

Huntington
Levi J. Dean, 2748 Guyan Ave.
Wm. Francis Diehl, 1827 12th Ave.
Frampton & Bowers, 412 11th St.

Morgantown
Elmer F. Jacobs, Union Bank & Trust Bldg.

Wheeling
Frederick Faris, 1117 Chapline St.
Edward Bates Franzheim, 1425 Chapline St.

Wisconsin

Amery
E. F. Klinger

Appleton
Raymond N. LeVee, 117 E. College Ave.
Smith & Brandt, Zuelke Bldg. (also in Manitowoc)

Boscobel
Joseph G. Durrant

Eau Claire
Aloysius W. Bayer, 204 Grand Ave., E.
Howard M. Nelson, S. A. F. Bldg.
Carl Volkman, McGrath Bldg.

Green Bay
Foeller, Schober & Berners, 310 Pine St.
Oppenhamer & Obel, 110 S. Washington St.

La Crosse
Parkinson & Dockendorff, Box 785

Madison
Law, Law & Potter, 1 S. Pinckney St.
Frank S. Moulton, 110 E. Washington Ave.
Arthur Peabody, State Capitol
Starck & Schneider, Inc., 8 S. Carroll St.
Edward Tough, E. Washington St.

Manitowoc
Wm. J. & F. W. Raeuber, Savings Bank Bldg.
Smith & Brandt, Dempsey Bldg. (also in Appleton)

Marinette
Max Hanisch, 1943 Hall Ave.

Marshfield
Gus A. Krasin, 202½ S. Central Ave.

Milwaukee
R. H. Bierman, N. 34th & Thurston Ave.
E. Brielmaier & Sons Co., First Wisconsin National Bank Bldg.
Peter Brust, 135 W. Wells St.
Clas & Clas, Inc. & C. C. Reynolds, 759 N. Milwaukee St.
Ebling & Plunkett, 739 N. Broadway
Eschweiler & Eschweiler, 720 E. Mason St.
Gerrit J. de Gelleke, 152 W. Wisconsin Ave.
Herbst & Kuenzli, 1249 N. Franklin Pl.
Lindl & Schutte, Inc., 1025 E. Circle Drive
R. A. Messmer & Bro., 231 W. Wisconsin Ave.
Alfred H. Siewert, 2309 N. 36th St.
Thomas S. Van Alyea, 1422 E. Albion St.
Henry J. Van Ryn, 152 W. Wisconsin Ave.
Guy E. Wiley, 1111 N. 10th St.

Oshkosh
Auler, Jensen & Brown, E. R. A. Bldg.

Racine
J. Mandor Matson, 528 Baker Block

Two Rivers
Sylvester Schmitt, Bank Bldg.

Waukesha
Sylvester A. Snyder, 202 Roberts Ave.

Wisconsin Rapids
Hougen & Henderson, Room 8, Wood Block

Wyoming

Casper
Goodrich & Krusmark

Cheyenne
William DuBois
Frederick H. Porter, Hynds Bldg.

Alaska

Juneau
N. Lester Troast, Shattuck Bldg.

Canal Zone

Balboa Heights
Meade Bolton, Box 23

Hawaii

Honolulu
C. W. Dickey, Damon Bldg.

Philippine Islands

Manila
Cesar H. Concio, 843 Rizal Ave.

Porto Rico

Santurce
Rafael Carmoega, Carrion's Court, Stop 44

Canada

Calgary, Alta.
W. A. Branton, Calgary School Board, 6th St. & 4th Ave.

Halifax, N. S.
C. A. Fowler & Co., Capitol Bldg.
A. E. Priest, 428 Robie St.

Montreal, Que.
David R. Brown, 1010 St. Catherine, W.
Alcide Chausse, 706 St. Gabriel St.
Henry Talbot Gouin, 1022 Laurier Ave., E.
Alfred Potvin, 750 St. Gabriel St.
C. A. Reeves, 1889 Pie. IX Blvd.
C. R. Tetley, 630 Dorchester St., W.
Edward J. Turcotte, Dominion Square Bldg.

Ottawa, Ont.
W. C. Beattie, 66 Craig St.
Lucien LeBlanc, 45 Rideau St.
Richards & Abra, 55 Metcalfe St.

Quebec, Que.
Pierre Levesque, 115 St. John St.

Regina, Sask.
F. H. Portnall, Credit Foncier Bldg.
J. H. Puntin, Darke Bldg.
Van Egmond & Storey, McCallum Hill Bldg.

St. Catharines, Ont.
Lionel A. Hesson, 16 Welland Ave.

St. Hyacinthe, P. Q.
G. Rene Richer, 242 Girouard St.

St. John, N. B.
H. Claire Mott, 13 Germain St.

Sherbrooke, Que.
Louis N. Audet, Wellington St., N.

Toronto, Ont.
S. B. Coon & Son, 4 St. Thomas St.
Craig & Madill, 96 Bloor St., W.
Mathers & Holdenby, 96 Bloor St., W.

Vancouver, B. C.
Harold Cullerne, 325 Howe St.
Harry W. Postle, School Board Office
Sharp & Thompson, 626 Pender St.

Windsor, Ont.
D. J. Cameron, Bartlet Bldg.
Sheppard & Masson, Equity Chambers

Winnipeg, Man.
W. A. Martin, Public School Board

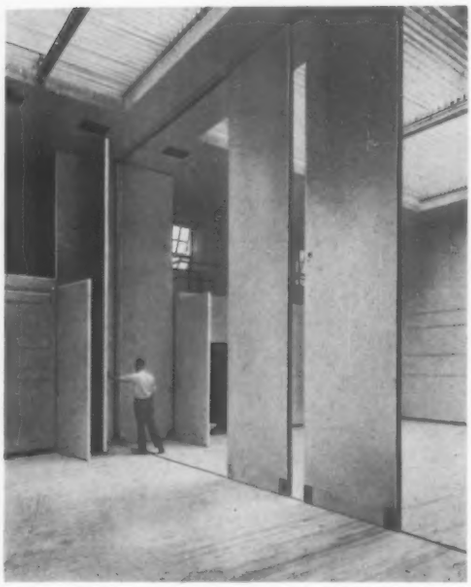
Wolfville, N. S.
Leslie R. Fairn, Main St.

AMERICAN CAR AND FOUNDRY COMPANY

WOODWORKING DIVISION

30 Church Street, New York, N. Y.

FAIRHURST (Patented) "UNITFOLD" AND "DUOFOLD" PARTITIONS



Unitfolds in the Payne Whitney Gymnasium of Yale University
John Russell Pope, Architect
A special type of the Fairhurst patent folding wall, known as the Unitfold, was the only partition that could fit the conditions existing in this case.

For Schools, Churches, Clubs, Hotels, Y.M.C.A. and Other Public Buildings or Private Residences Where Division of Space Is Required or a Multiplicity of Rooms Is Desired

This highly perfected partition has been so improved and so simplified, that the manufacturers believe it leaves nothing to be desired. It is the only partition of its kind ever marketed.

Sound-proofed when specified.

DESIGN

The partition is not suspended. All weight is carried on the floor.

They are built up in **separate units,** making it possible to have an odd or an even number in any given partition. These units may slide from either end, or from the center to both ends, if the opening is unusually wide. In schools, partitions may be furnished with smooth, unbroken slate blackboard surfaces, having no V-joints or other breaks between units.

Units may be obtained in any design, to harmonize with, or follow any plan of interior decoration. A mortise lock in the end unit locks partition in place.

A shuttle or wicket door can be provided in any unit for communicating purposes. Specifications on request.

"Unitfold" partitions are so easy to operate, regardless of size, that cables, motors and crank handles are unnecessary as the units are not hinged. The interlocking joints press closely together when the units are closed in position and locked. One lock located in the end door controls the entire partition, and odd or even numbers of doors can be used.

THE FOLLOWING POINTS IN ITS FAVOR ARE EXCLUSIVE

(1) Automatically adjusts itself.
(2) Units cannot be displaced.
(3) No hinges or bolts used or necessary.
(4) Forms a rigid wall in perfect alignment.
(5) Can be locked in place with one ordinary key.
(6) Can be operated with one hand, no matter what size.

DIFFERENCE BETWEEN UNITFOLD AND DUOFOLD

As the name implies, the Unitfold is in one piece, the Duofold is a two-piece unit hinged together and requires bolts. It is the older type. The Unitfold is the more desirable and is recommended.

FAIRHURST PATENTED SCHOOL WARDROBES: SINGLE AND DUAL OPERATING DOORS

For the past several years, there has been a constantly increasing demand for an efficient practical wardrobe for schools, etc.

The Fairhurst School Wardrobe was specifically designed to meet this need.

The operating mechanism is entirely different from any ever designed, and is the last word in simplicity and efficiency.

IMPORTANT FEATURES

Forty-five pupils can be accommodated in a space 2 ft. deep by 12 ft. wide, thereby reducing the cubage of buildings.

The depth of wardrobe is unchanged, whether doors are open or closed.

The doors pivot, there being no rollers or wheels used, making for quiet and smooth operation.

There is no track on the floor.

The left-hand door of each pair, automatically operates in conjunction with right-hand door, in the dual type.

Operating hardware is easy to adjust in case of building settlement.

BLACKBOARDS — SLATE

Wardrobes, where desired, are equipped with a continuous slate blackboard with close fitting joints, giving a smooth, even writing surface, when doors are closed. A spring latch keeps them rigid. Such wardrobes are equipped with chalk rails.

For High School wardrobes, a lock is furnished which enables one to lock the entire wardrobe with one key.

SPECIFICATIONS

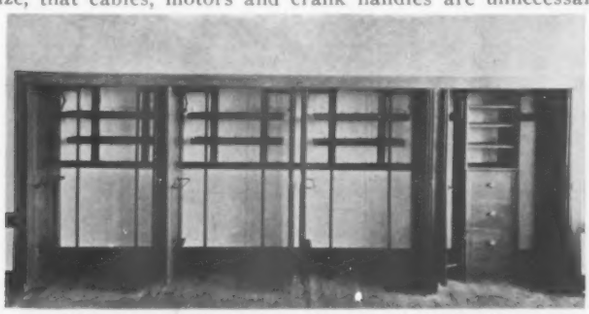
Where indicated on plans, furnish and install Fairhurst [single] [dual] operating type disappearing door wardrobes.

Operating hardware to be adjustable.

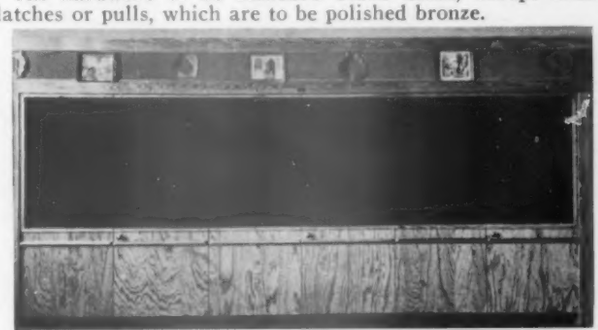
Wardrobes to be furnished complete with all hooks, shelves, etc. No track to be used on floor.

Doors to be standard [flush] [panel] design 1⅜ in. thick, veneered on built-up cores and equipped with continuous slate blackboard and chalk rails.

All hardware to be standard black finish, except hooks, latches or pulls, which are to be polished bronze.



Interior of Wardrobe with Teacher's Section



Fairhurst Disappearing Wardrobes with Continuous Slate Blackboards

SARGENT BUILDING SPECIALTIES CO.

16 Warren Street
New York, N. Y.

THE EQUAL-AIRE INCINERATOR

The problem of waste disposal in a school building is one of considerable importance. Waste paper accumulations in classrooms, sweepings, garbage and lunch remains from the school cafeteria, paper towels and other refuse from washrooms and lavatories, all require immediate, sanitary removal. The hoarding of large amounts of loose paper in the basement of the building constitutes a **fire menace.** Daily removal of refuse and garbage by truck is **costly**—requiring labor, time and equipment for transporting.

Up-to-date schools, both large and small, public and private, from elementary grades to colleges and universities, are now using some form of **incineration** for **safely, quickly** and **sanitarily** disposing of all forms of refuse. The **right type** of incinerator will do this **economically,** too, as compared with any other method of rubbish removal.

The **right type** of incinerator is one that provides **equal air distribution** in the combustion chamber—which means, in terms of incineration, the **utmost waste destruction,** in the **shortest time,** with **maximum consumption of liberated gases.**

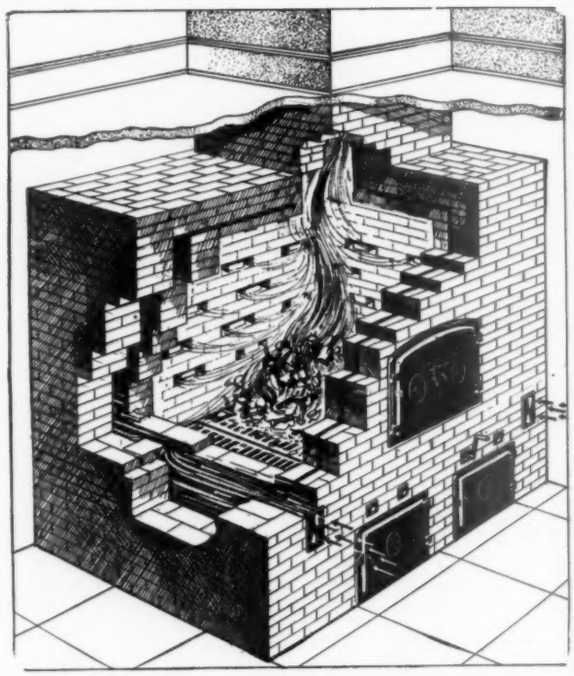
HOW THIS IS ACCOMPLISHED IN THE EQUAL-AIRE INCINERATOR:

In the Equal-Aire, equal distribution of air is attained by means of air controls in the front or side of the incinerator which supply air through a duct between the firebrick and common brick walls to a series of air ports in the firebrick wall. By distributing these ports over the entire wall surface, a constant flow of air on all sides of the waste is assured, thus providing a drying-out process before burning.

Top burning, which is essential to the elimination of obnoxious odors, is effected by the feeding of pre-heated air through the ports. Besides furnishing air in correct proportions to all parts of the incinerator, a steady circulation is created, thereby insulating the outer walls, which reduces the possibility of heat cracks much more effectively than a dead air space.

References—Schools Using Equal-Aire Incineration:

Washington, D. C.—Taft Jr. High School; Woodrow Wilson High School; Anacostia Jr. High School
Greenport, L. I.—Greenport Grade and High School
Greenwich, Conn.—Greenwich High School
Port Jefferson, N. Y.—High School
Middlebury College, Middlebury, Vt.
Massachusetts State College, Thatcher Hall, Amherst, Mass.
And others



Showing "Equal-Aire" Construction with Live-Air Insulating and Air-Feeding Duct

Special Features of the Equal-Aire Incinerator

Hopper doors, aluminum or cast iron, with checking device which automatically closes the door and prevents slamming
Grate assembly of finest grade high silicon gray iron
Firing doors of heavy cast iron, double leaf, with perforated cast iron liner to prevent warping
Air intake controls, which permit the feeding of air to the top of the fire without opening ash doors and creating excessive draft
Spark arrestor, a heavy galvanized wire mesh spark arrestor to cap the flue, thereby preventing the escape of flying sparks

Write for complete specifications.

STANDARD LAYOUTS AND CAPACITIES FOR SCHOOLS

Model	Schools	Grate Area (Sq. Ft.)	Minimum Flue Size (Inside Diameter in Inches)		Standard Height of Incinerator Above Basement Floor
	Number Students		Using No. 1 or 5 Hopper Doors	Using No. 3 or 6 Hopper Doors	
23 or 32	250	7.5	18x18	16x16, over 4 story, 18x18	6'-8"
24	250-350	10	18x18, over 4 story, 20x20	16x16, over 4 story, 18x18	7'-2"
25	300-400	11	18x18, over 4 story, 20x20	16x16, over 4 story, 18x18	7'-0"
33	400-500	12.5	18x18, over 4 story, 20x20	16x16, over 4 story, 18x18	7'-2"
34 or 26	500-700	14.5	20x20, over 6 story, 24x24	16x16, over 4 story, 18x18	7'-2"
35	700-1000	18	20x20, over 6 story, 24x24	16x16, over 4 story, 18x18	7'-2"
36	1000-1250	21	20x20, over 6 story, 24x24	16x16, over 4 story, 18x18	7'-2"

Offset Type

Hopper Doors with Concealed Checking Device

Flush Type

HOPPER DOORS

No.	Type	Material	Approx. Door Size
1	Offset	Aluminum	12 x14 ins.
3	Offset	Aluminum	10 x11½ ins.
5	Flush	Cast Iron	12½x11 ins.
6	Flush	Cast Iron	10 x 8½ ins.

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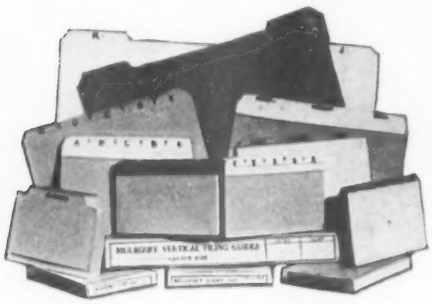

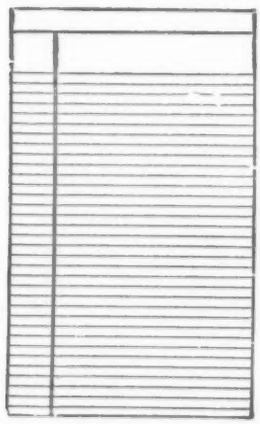

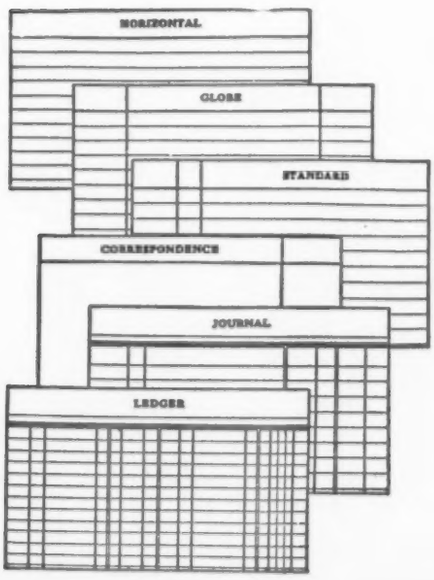

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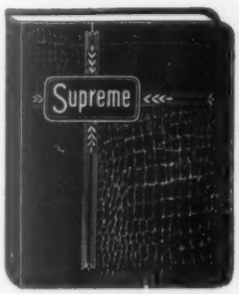

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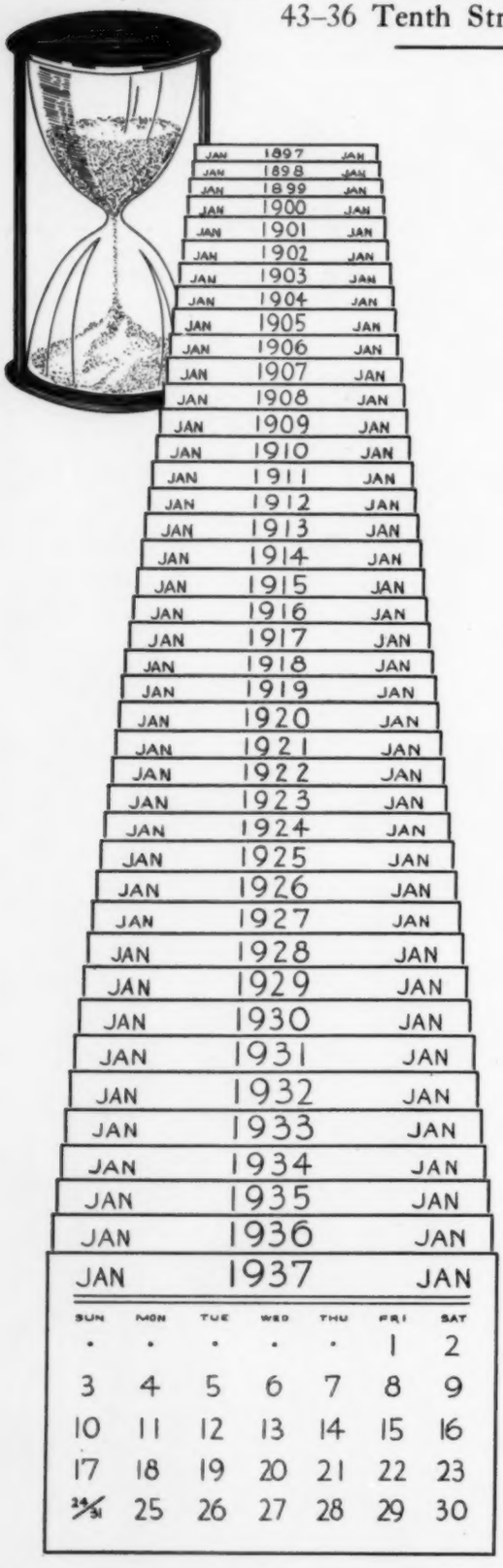

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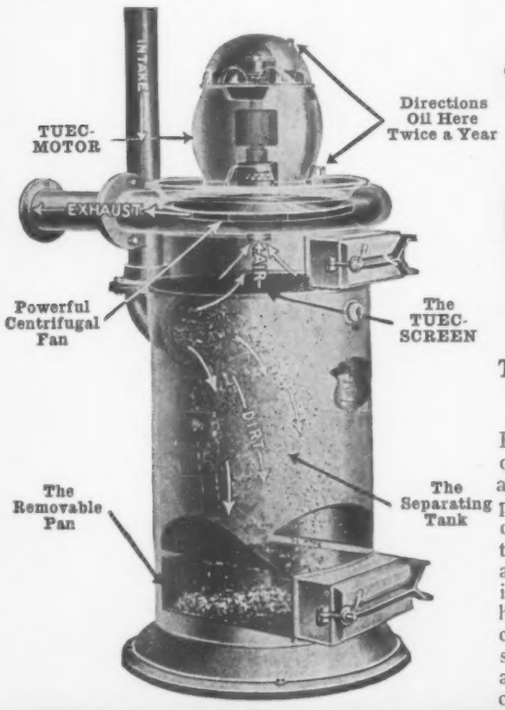

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TUEC Suction Cleaning Tools for Swimming Pools

The TUEC Suction Cleaning Tool removes all sediment and foreign matter from the bottom of a swimming pool by suction, without draining off the water. With the TUEC method, inlet valves, placed in the sides of the pool just below the water line, are connected to the circulating pump by means of pipe. One end of the suction hose is attached to the inlet, and the other end is attached to the cleaning tool, which is moved over the bottom of the pool by means of the sectional handles. The sediment is loosened by the brush and sucked through the nozzle into the hose, where it is conducted to the sewer.

Portable pumping equipment, for either Tuec Standard or Tuec Double Action Pool Cleaner, is furnished for those pools where connection to your regular pumping equipment is not practicable. These pumps, mounted on trucks, are easily moved about the pool, are self-priming and require only one inlet for connection to the cleaner and no piping layout.

The TUEC Double-Action Suction Pool Cleaner is designed for large pools, both indoor and outdoor, but may be used in any size pool. It is operated by two men—one on each side of the pool.

Booklets on both Standard and Double-Action Suction Pool Cleaners are available on request. Included in the booklet on the Double-Action Pool Cleaner is also an illustrated description of the TUEC Sand Remover, for pools with sand beaches.

TUEC Pool Cleaner

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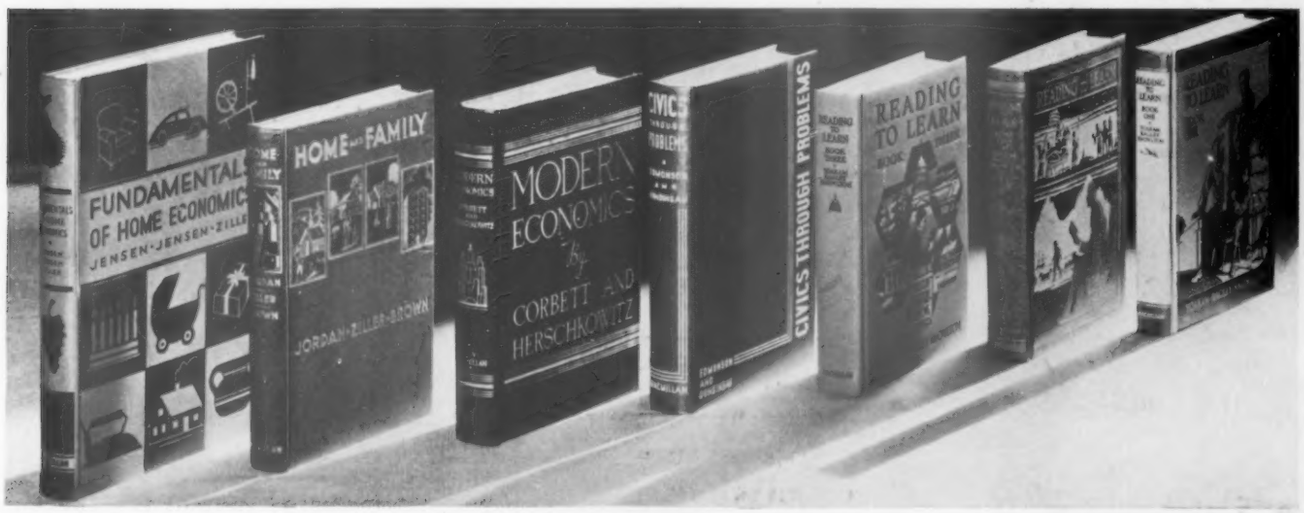

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